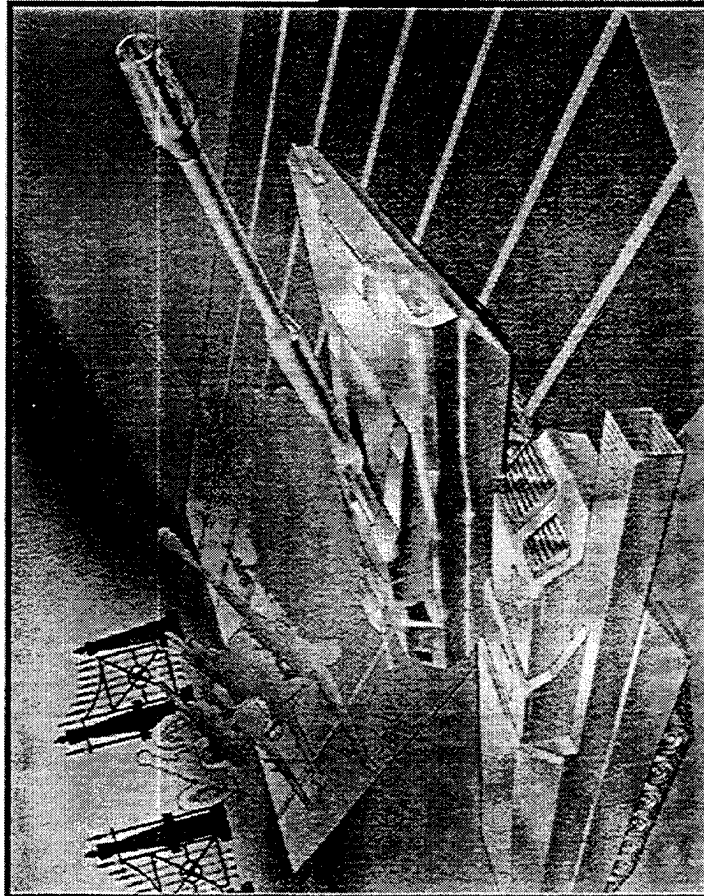
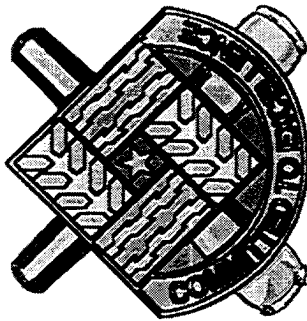


IOC Advance Planning Briefing for Industry

US Army Research, Development &
Engineering Center

(ARDEC)



19960607 008

BG James W. Bo
Commanding General

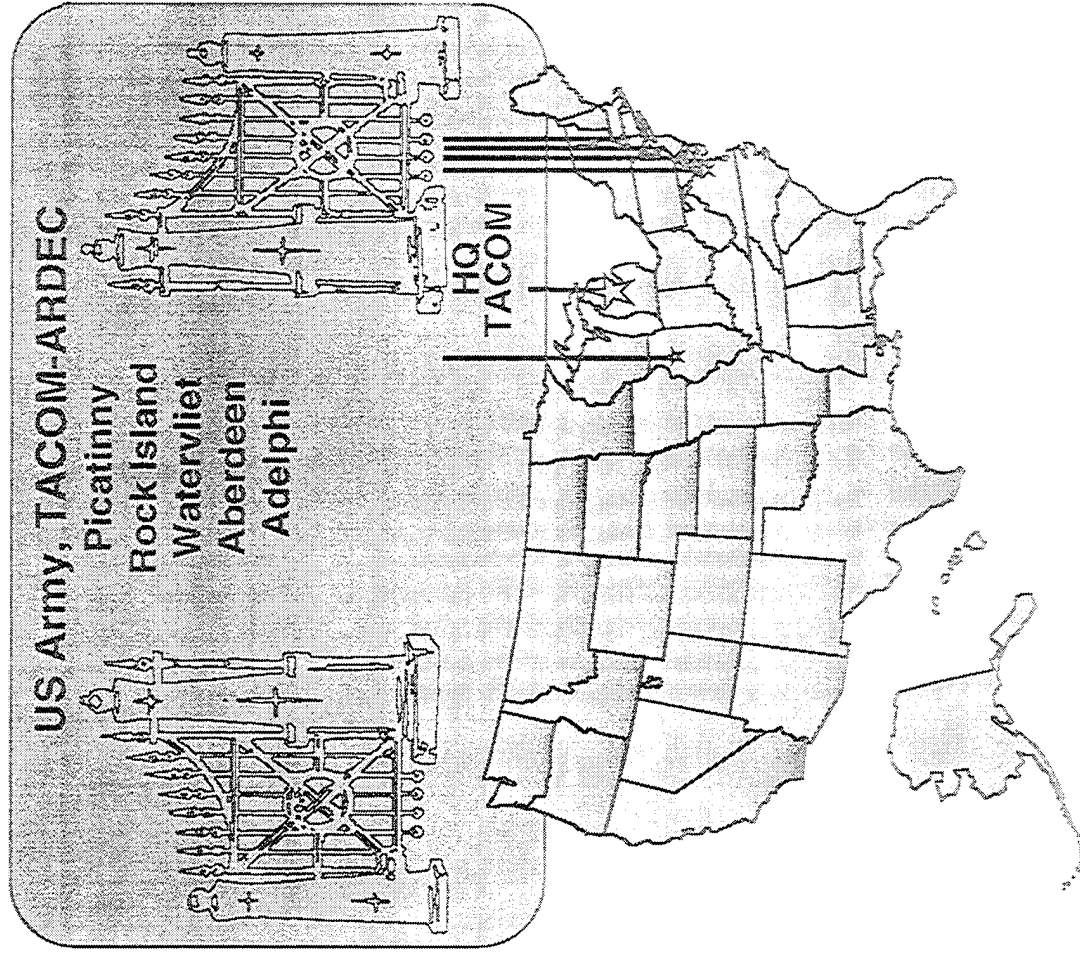
DISTRIBUTION STATEMENT A
Approved for public release
Distribution Unlimited

Briefing Outline

■ This is ARDEC

■ The Future

■ Summary



DISCLAIMER NOTICE



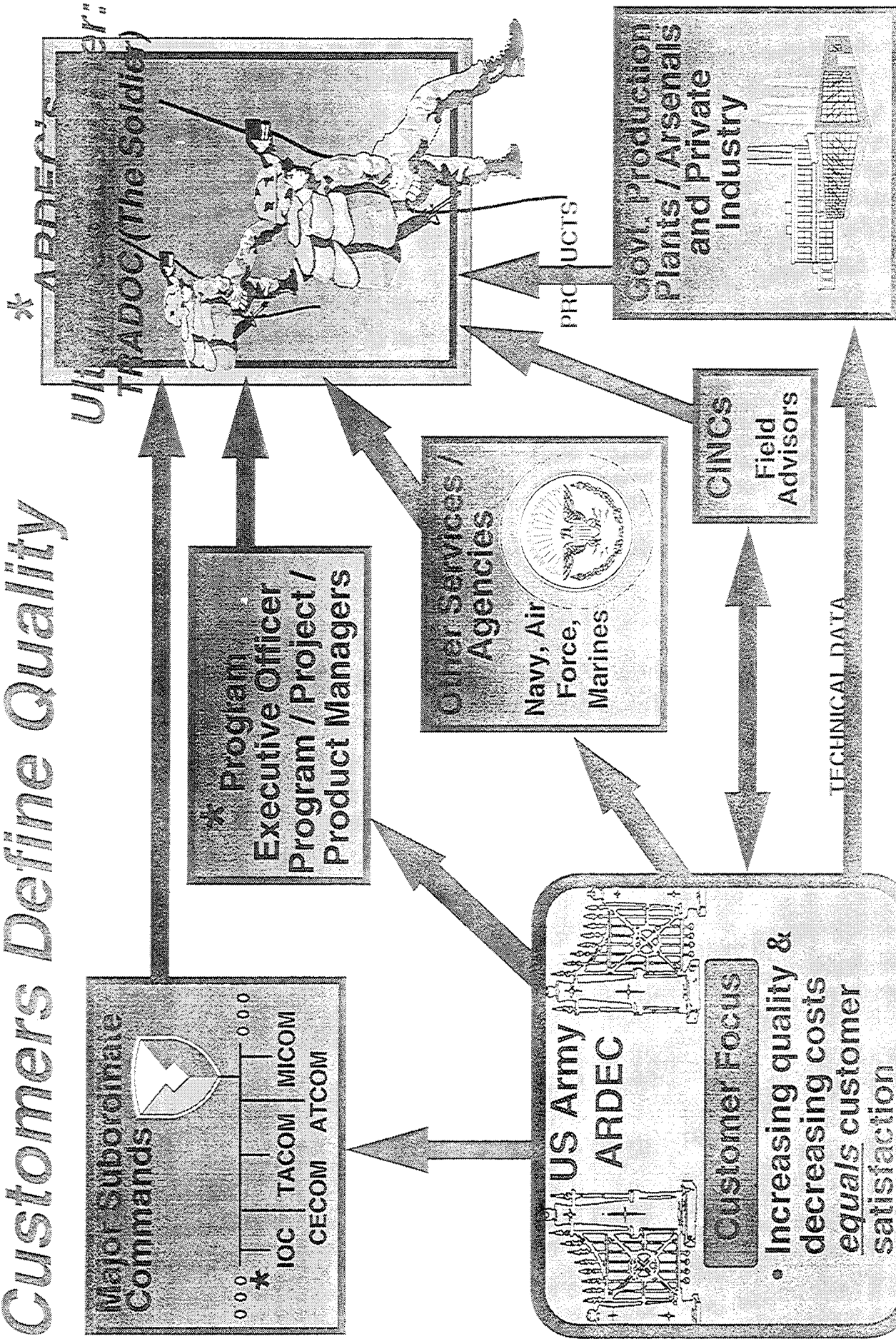
THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.



ARDEC'S VISION

Provide Our Fighting Forces
With The Most Advanced
Armament Materiel To Assure
Victory In Combat At The
Lowest Cost And In The Shortest
Possible Time.

Customers Define Quality



** Major Customers

ARDEC Financial Restructuring

BACKGROUND

- Customer Perspective = Costs Too High
- Internal PEG Study = Process/Augmentation Issues
- External AMCMEA Review = Confirmed PEG Study
- Teams Formed = Defined Goals & Objectives

✓ Financial Restructuring Team Chartered

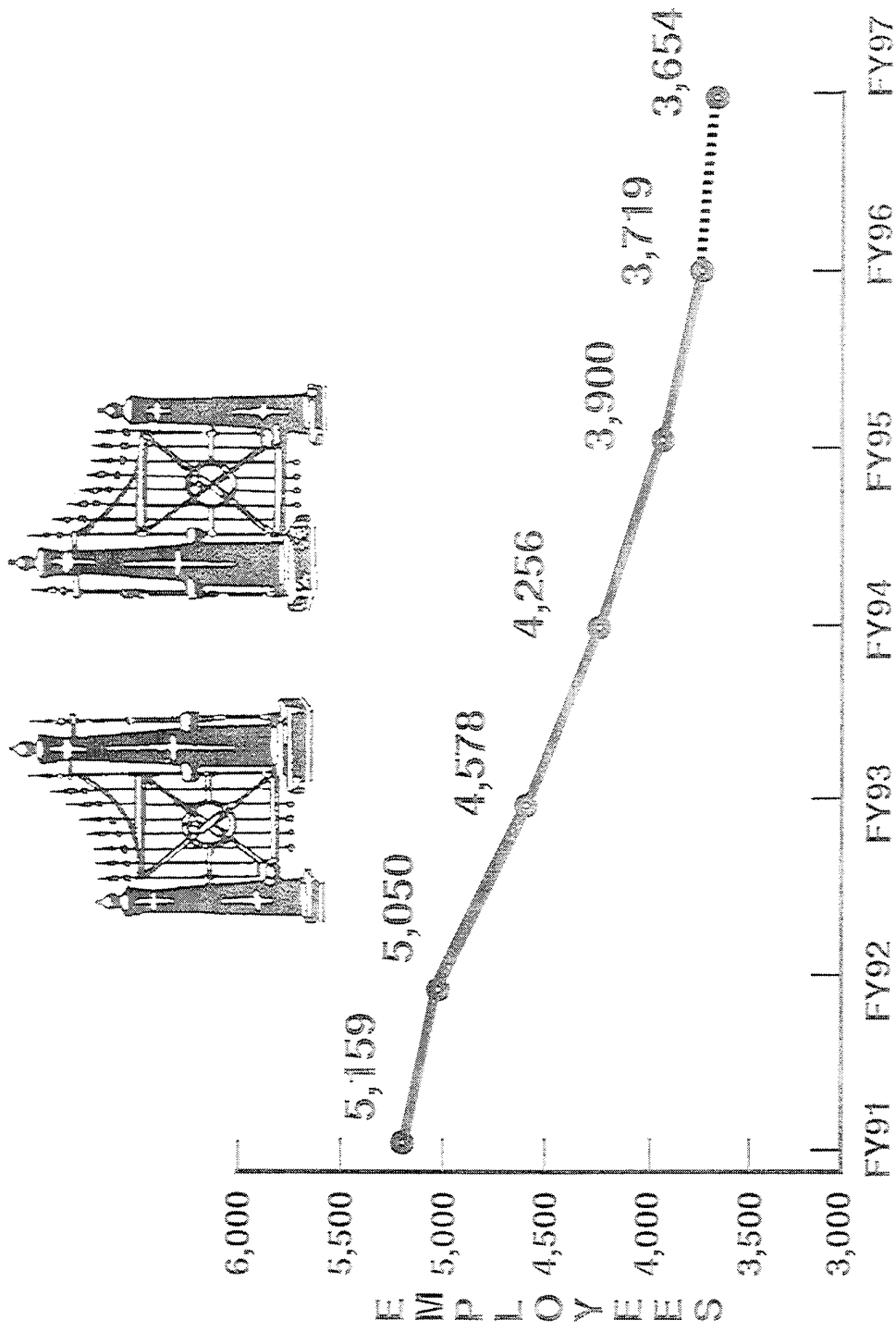
- Become the Most Cost Effective RDEC in AMC
- Define Overhead & Reduce It
- Fix Process/Augmentation Issues
- Lower Customer Costs
- Push Continuous Improvement

ARDEC Financial Restructuring

WHAT THIS MEANS

- ARDEC is Fully Committed to Our Long Term Future, Reducing Customer Costs, & Strong Financial Integrity
 - » Cost Discipline Process Installed
 - » Major Reductions to Cost and Personnel in Process - RIF Package Submitted
 - » ARDEC and Picatinny Community Will Deliver High Quality
 - High Value - Cost Managed Products and Services
 - » Restructuring Will Continue to Achieve Further Cost Reductions

The New, Slimmed Down & Improved, Team Picatinny

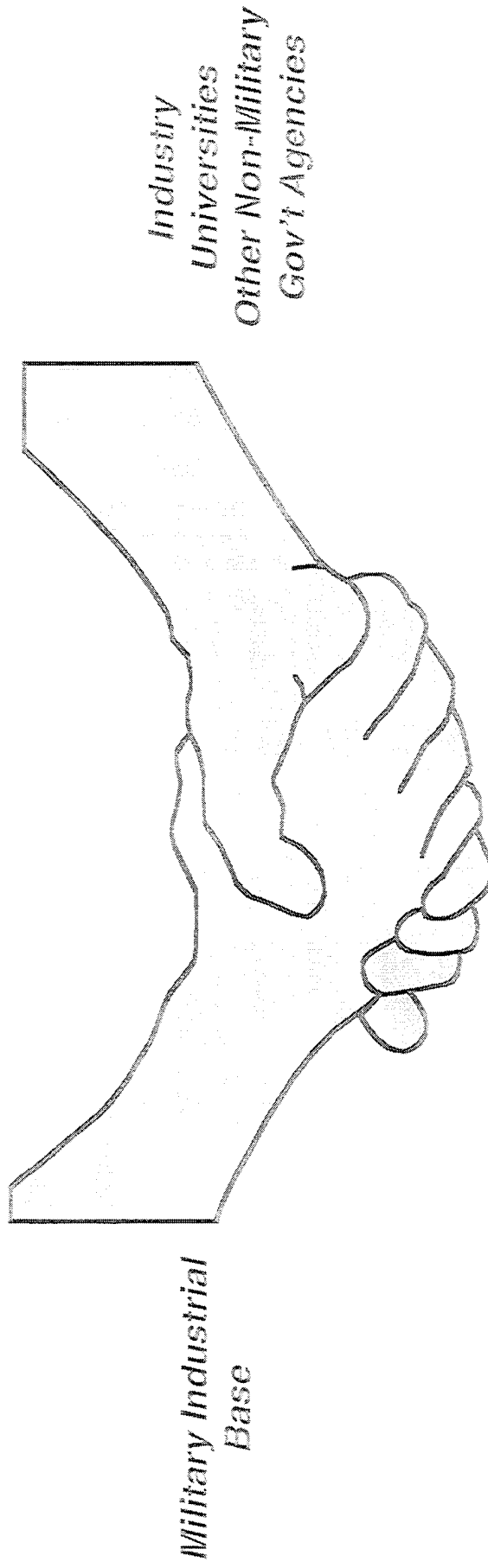


New ideas to maintain our skilled workforce and quality facilities

- Dual-Use Partnering
 - Cooperative Research and Development Agreements (CRADAs) with Industry and Academia
 - MOU's with Other Federal Agencies, State & Local
 - Picatinny Innovation Center (already in place)
 - County Industrial Park (new idea)
 - Manufacturing Technology Center (new idea)
- Facility Outleasing

What is Dual-Use?

- A process by which DoD partners with the U.S. industrial base towards affordable defense procurement

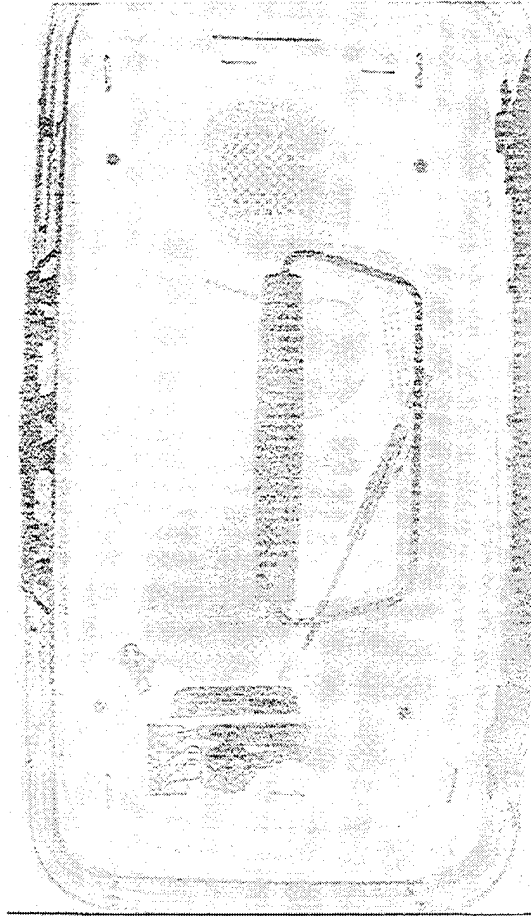
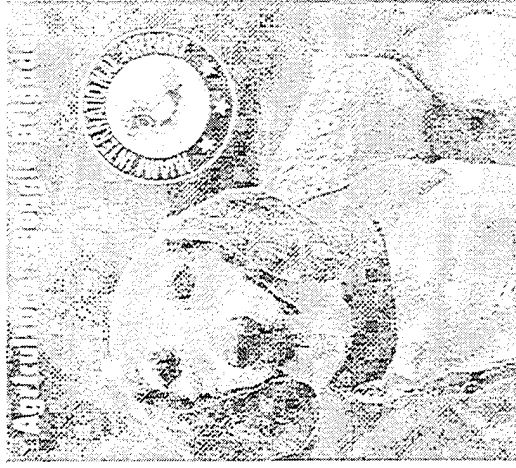


National Industrial Base

Automated Baggage Inspection System

Tomographic X-Ray Imaging Spectroscopy (TXIS)

- U.S. Dept. of Agriculture requested ARDEC develop system to identify agricultural products in airline baggage
- MOU used to transfer funds
- System uses Neural Network technology to learn from examples
- Introduced color to X-Ray world (not shown here)
- Geometric constraints and high rate throughput required developing new x-ray source technology



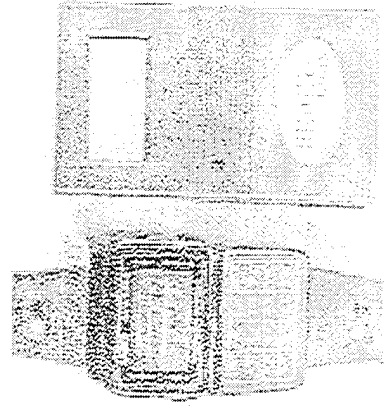
Current Technology

Future Technology

Help for Disabled Children - Health & Safety



*Jenna,
Age 2*



- Some children suffer from a rare form of epilepsy called "Status Epilepticus"
- This disease causes almost invisible seizures, often combined with serious breathing problems
- A unique partnership was formed between ARDEC's cannon designers at Benet Laboratories and the Center for the Disabled in Albany, New York
- Army weapon auto-loader technologies such as sensors, control logic and micro circuitry were applied to develop a device to automatically detect and warn of these almost invisible seizures.
- Worn like a bracelet, the device detects unusual vibrations characteristic of a seizure and sets off a remote alarm to warn parents or doctors.

ARDEC/Benet Laboratories CRADA Activity

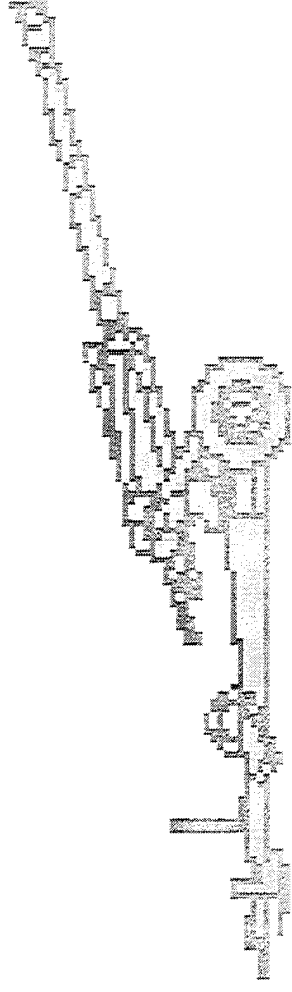
- The ARDEC Benet Laboratories has established fifteen Cooperative Research and Development Agreements (CRADA's) with industry and academia to help transfer gun-related technology to the private sector.
- Recent Benet tech transfer initiatives have supported the development/improvement of industry candidates for the Army/Marine Lightweight 155mm Towed Howitzer and many other applications.

Lockheed-Martin

- Weapon Research, Design and Engineering
 - Design and Engineering of Lightweight 155mm Towed Howitzer
- ## Phoenix Engineering
- Weapon Technology
 - Design and Engineering of Lightweight 155mm Towed Howitzer

On Time

Within costs

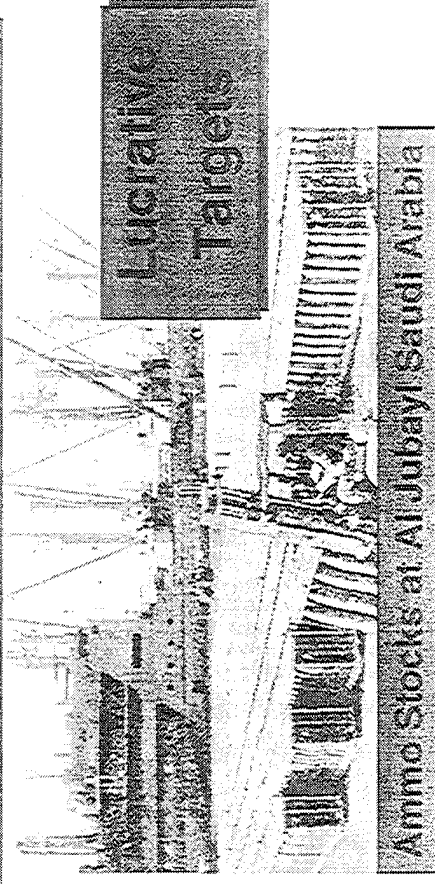
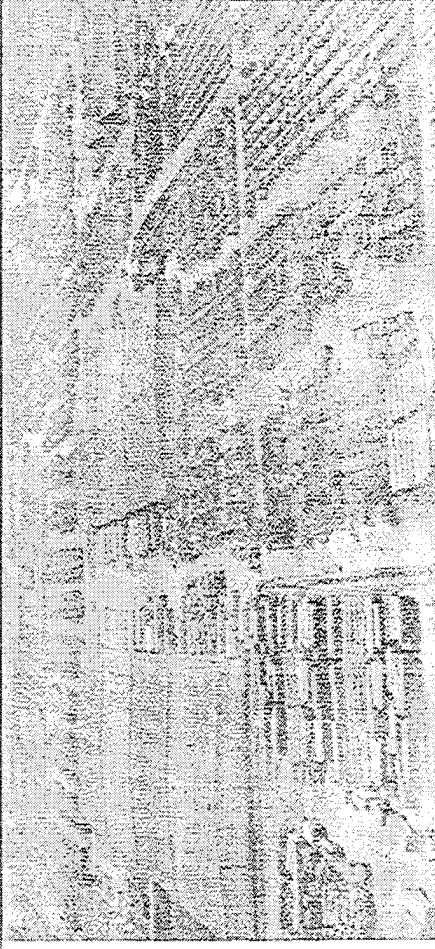


Technology Strategy for FY95 thru FY00

- **Maintain existing heavy force capabilities as "World's Best" -**
 - Insure our continued ability to defeat potential threat Armor with state of the art ERA.
 - Improve tank system accuracy to engage at extended acquisition ranges of 2d Gen FLIR.
 - Defeat Active Protection Systems.
 - Increase Range and Accuracy of Artillery.
- **Improve the Lethality and Deployability of the Light Forces.**
 - Complete ARDEC portions of the the RFPI.
 - Improve the Lethality of the Individual Soldier.
 - Reduce Logistics Burden of the Light Forces.
 - Improve Ammo Resupply and Survivability.
- **Pursue new technology opportunities such as Less than Lethal.**
- **Maintain a solid base in smart munitions, energetics, warheads, automation, ammo logistics and the environment.**

Munitions Survivability Program

Space & resource constraints lead to high density of munitions at Entry Points

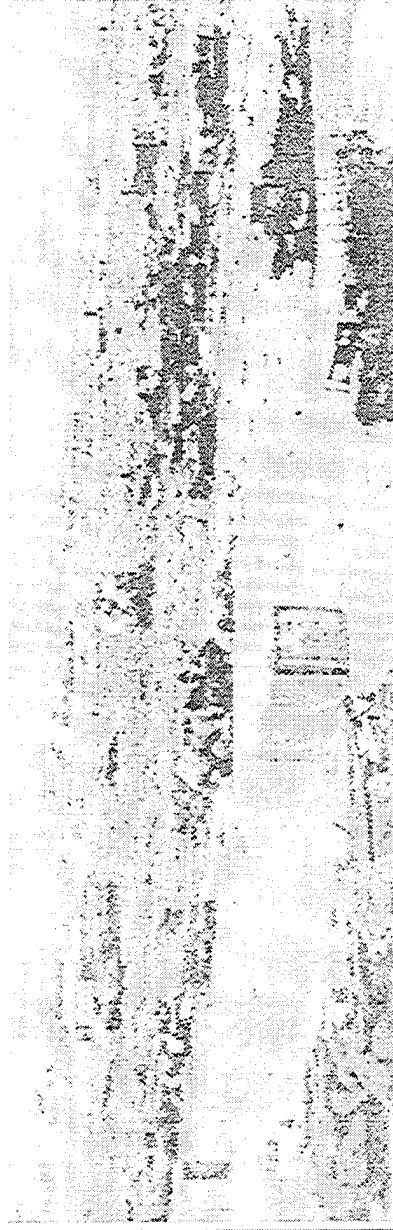


- OPFORs have the plans, capability & intent to inflict widespread destruction at insertion points and rear areas.

Limited Supply of High P(k) munitions.

CINCPAC keyed to these decisive munitions.

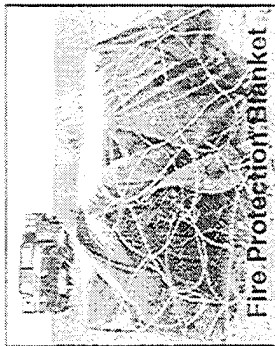
Fight will be conducted with supplies on hand.



Loss of limited resupply munitions will have serious impact on military objectives.

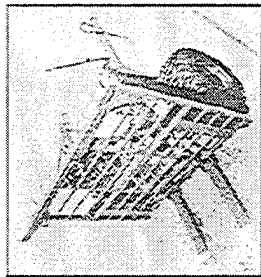
Munitions Logistics Survivability-ACTD

Survivability

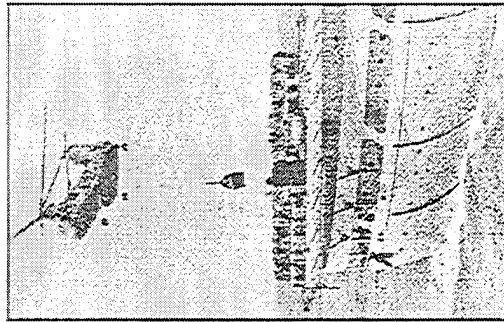


Fire Protection Blanket

Clearance



Emergency Resupply



Simple Ammo Handling Equipment

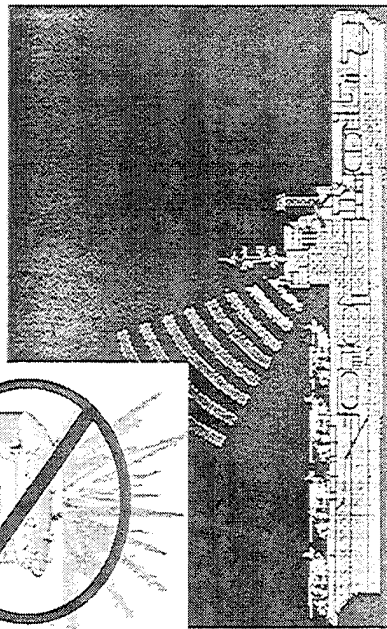
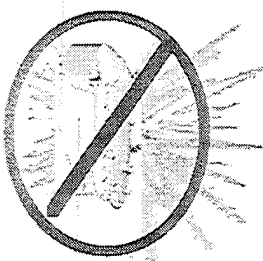


Container Handling Equipment

Rapid Barricade System

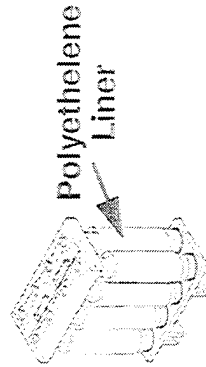


HERO



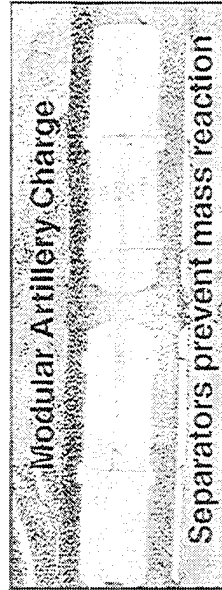
Munitions Survivability Integration

Survivable Packaging Designs



Polyethylene Liner

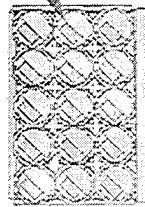
Survivable Munitions Designs



Modular Artillery Charge

Separators prevent mass reaction

Aluminum Barriers between Warheads



Fragment Impact Test
Survivable Hellfire Graphite Motor Case



Survivable Energetics

WAM Target Defeat with PAX-2A

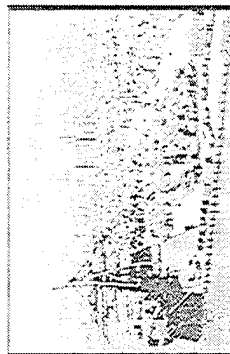
LX-14



PAX-2A

Equivalent Lethality

Logistics Enhancements



Fragment Impact Test
No detonation





ARDEC's Vision of the Future

Focused Technology Vision

21st Century Warfare

Protect the Force
Execute Precision Strikes
Win the Information War
Project & Sustain Combat Power
Dominate Maneuver

Logistics



Logistics

- * Insensitive Munitions
- * Total Asset Visibility for Stockpile Thru digitized Info
- * Rapid Rearm / Resupply



Artillery

Artillery

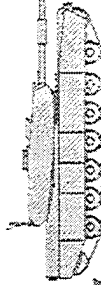
- * 60% Range Increase
- * 400% Rate of Fire Increase
- * 33% Manpower Reduction
- * Autonomous Operation
- * Battlefield Management & Control
- * Increased Mobility



Armor, Infantry, SOF

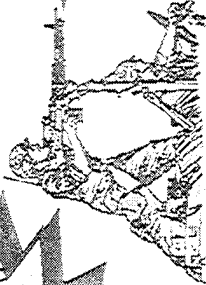
Armor

- * Top Attack Capability
- * Increased Hit Probability
- * Armament Systems in Light, Deployable Tanks
- * 140mm Lethality in 120mm Caliber Cannon
- * Reduced Crew Size/Stress



Infantry & SOF

- * Destruction of Very Hard Targets w/ Minimum Troop Exposure
- * >0.5 Hit Probability at 500m for Individual Combat Weapon
- * >0.5 Burst Hit Probability at 2km for Crew Served Weapon



Infantry, Engineers

Mortars

- * Enhanced Mobility
- * Enhanced Fire Control
- * Extended Range
- * Precision Guided

Land Mine Warfare

- * Wide Area Munition
- * Intelligent Minefield



Building on Our Business Process

ARDEC Workforce...

Reduced in Numbers

Trained / Skilled

Focused on Core Competencies

Organized to Facilitate IPPT

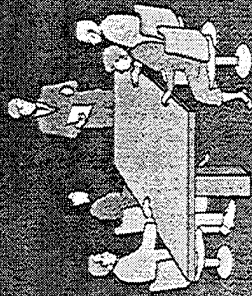
Driven to Use Smart Acquisition Practices

Best Value Contracting, etc.

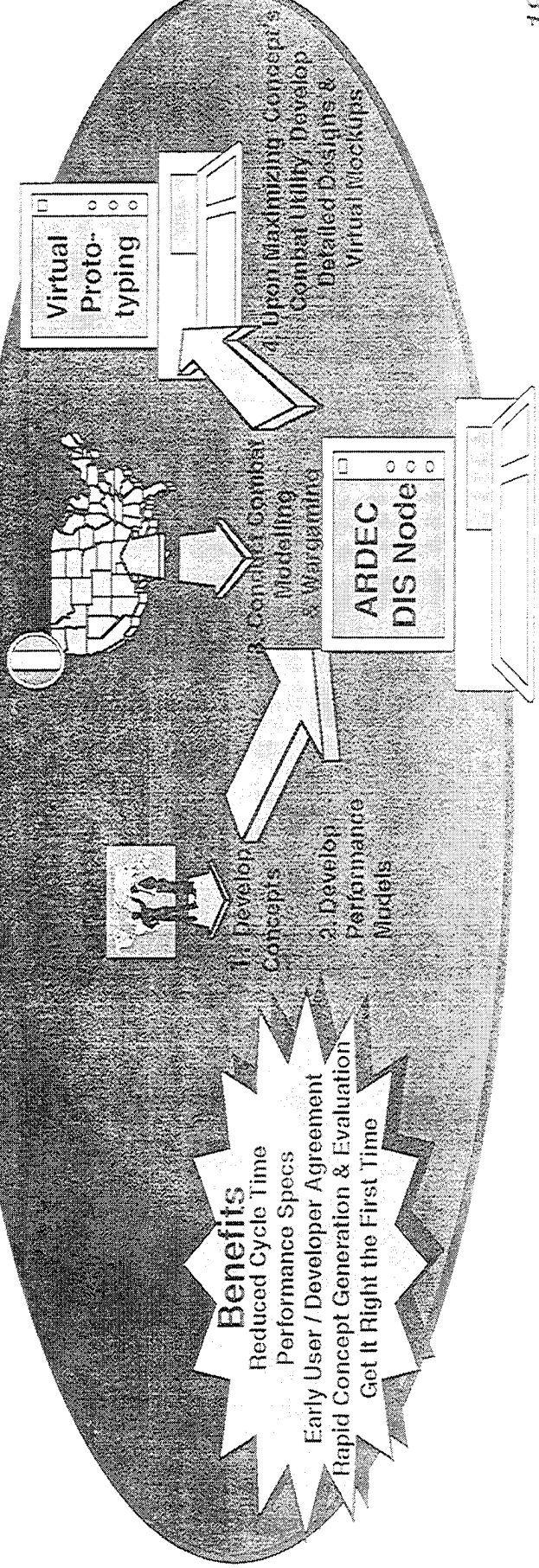
Empowered With Latest Tools

DIS

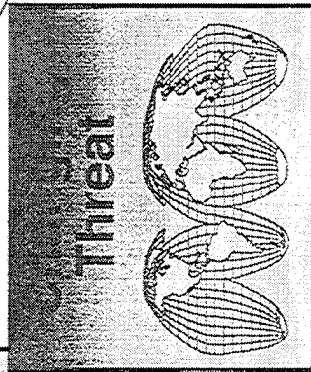
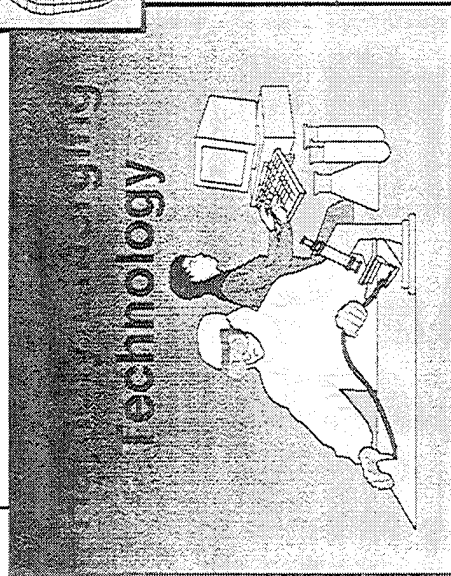
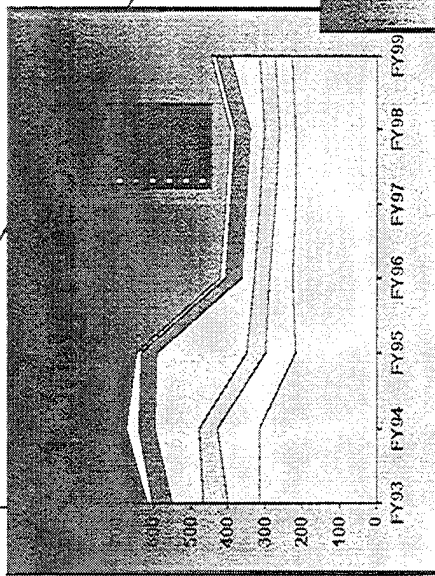
Virtual Prototyping, etc.



ARDEC Workforce
Reduced in Numbers
Trained / Skilled
Focused on Core Competencies
Organized to Facilitate IPPT
Driven to Use Smart Acquisition Practices
Best Value Contracting, etc.
Empowered With Latest Tools
Virtual Prototyping, etc.



Targeting Agility in Acquisition



Acquisition

Supporting the Process

Best Value Contracting

Integrated Product / Process Teams (IPT)

Contractor Certification (R&D)

Performance Specs

Non-Govt. Specs & Stds

Battle Labs / LAM

Electronic Bulletin Board

AFAM: DoD 5000.2-M Templates

TDP / SOW Automation

Roadshow Templates

2. Reengineering the process

Virtual Prototyping

DIS

Continuing w/ Proven Acquisition Approaches

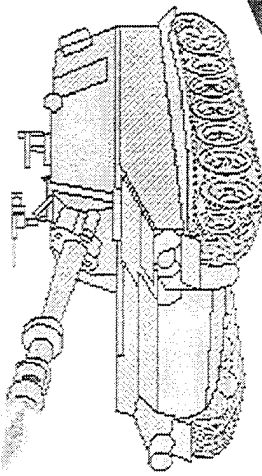
NDI & Leveraging

Continuing w/ Other Cost Saving Techniques

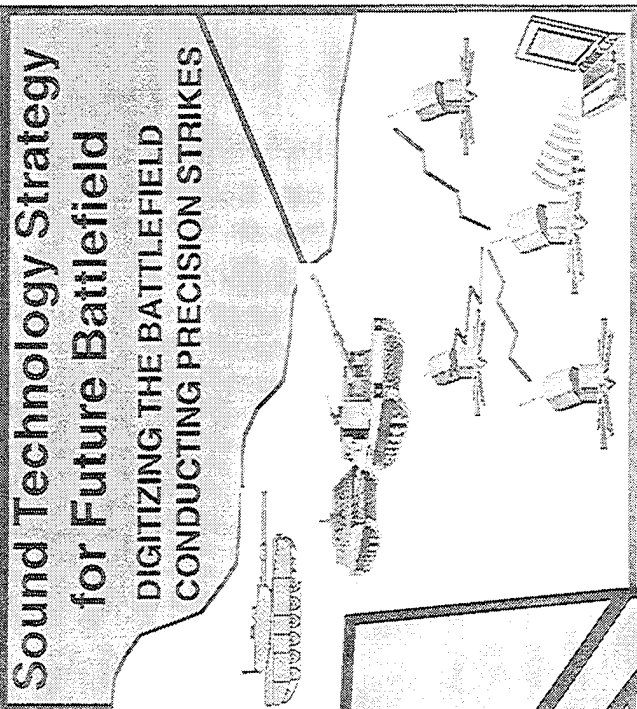
Value Engineering , etc.

Answering The Challenge

WE ARE "GUNS,
AMMUNITION, FIRE CONTROL
AND POLLUTION PREVENTION"



LEVERAGING THE
INFORMATION AGE TO
WIN THE BATTLE

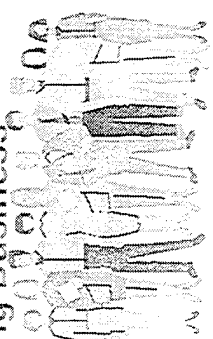


Sound Technology Strategy
for Future Battlefield
DIGITIZING THE BATTLEFIELD
CONDUCTING PRECISION STRIKES

Effectiveness
Proven in
Southwest Asia

ARDEC Postured for Future
First Class Training
New Facilities
New Program Initiatives
Reduced Cost of Doing Business
Reshaped Workforce
Linked to

TRADOC
Battle Labs





Summary

ARDEC Teaming With Industry

Integrated
Product
Team

=

Our Way of Doing
Business

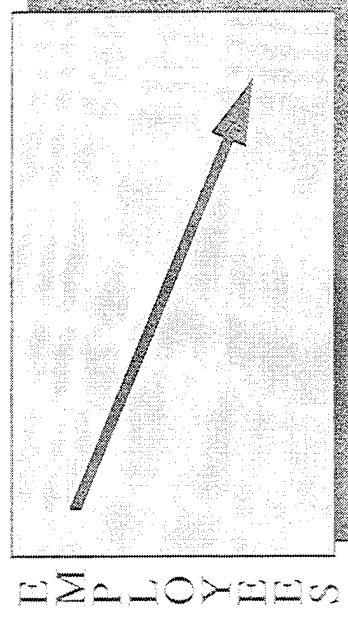
Industry Use of
ARDEC Facilities

- ATF
- DIS Node
- Labs
- Excess Facilities
- etc, etc, etc.

Contractors on ARDEC Teams

ARDEC on Contractor Teams

ARDEC

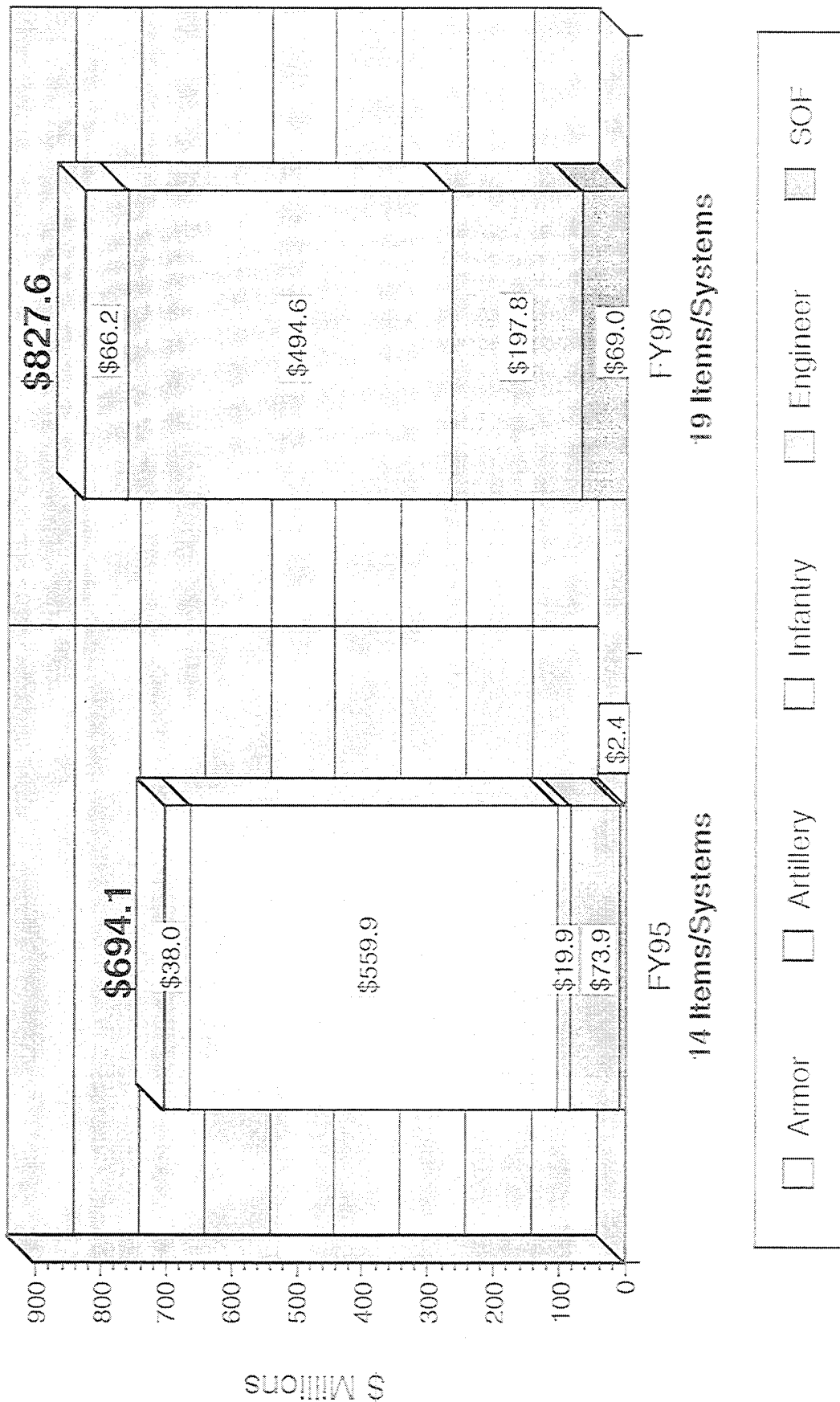


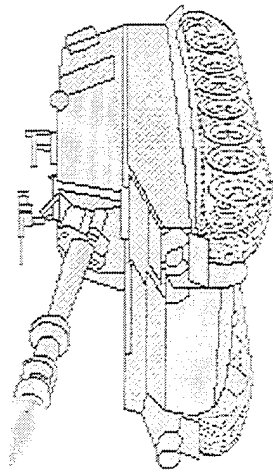
CRADA'S

Bottom Line: We Are Partners

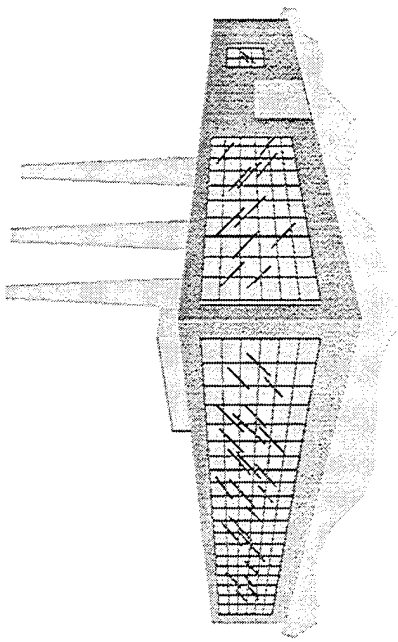
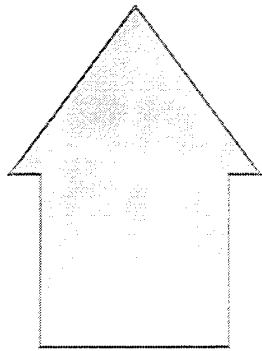
ARDEC Type Classifications Feed The Production Base

(POM Dollars (\$M) Programmed Through FY 2001)





*ARDEC
Technologies*

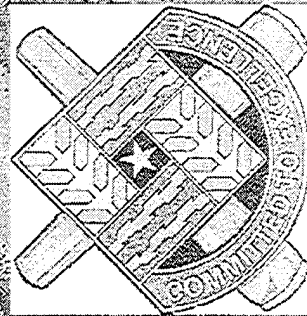


*Industry
Opportunities*

Advanced Planning Briefing For Industry

April 1-3 1996

*Mr. Carmine Spinelli
Technical Director*



AIRPORT Admission

1. Name _____
2. Address _____
3. City _____
4. State _____
5. Zip _____
6. Phone _____
7. Date _____
8. Signature _____

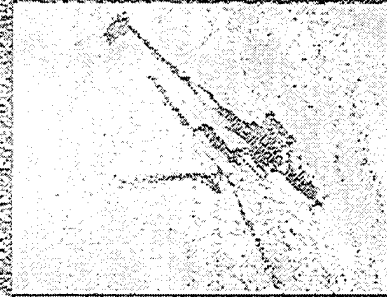
ARIDETC'S MISSION

- Strong Technology Base
- Development & Product Improvement
- Production & Fielding
- Life Cycle Engineering Support

Acquired Operations



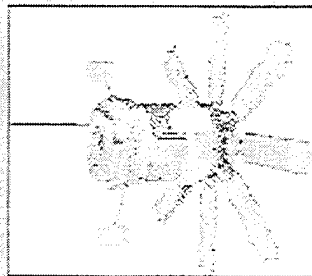
Assembly & Engineering



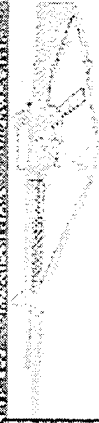
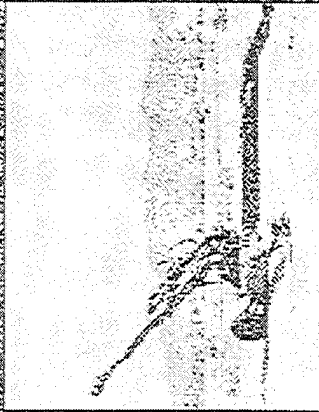
Advanced Engineering



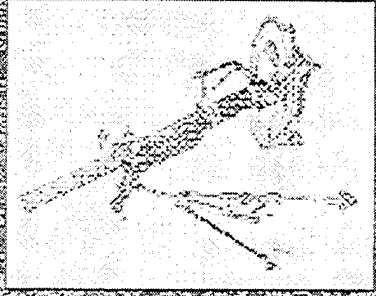
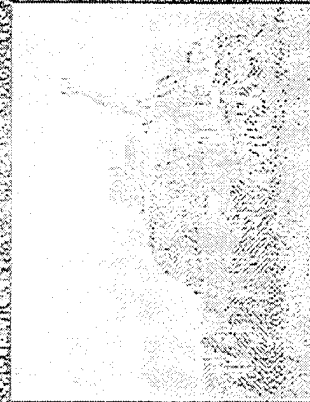
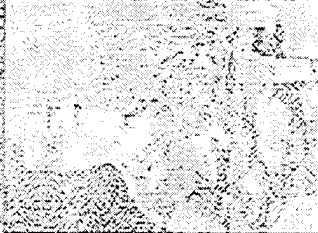
Computer Modeling



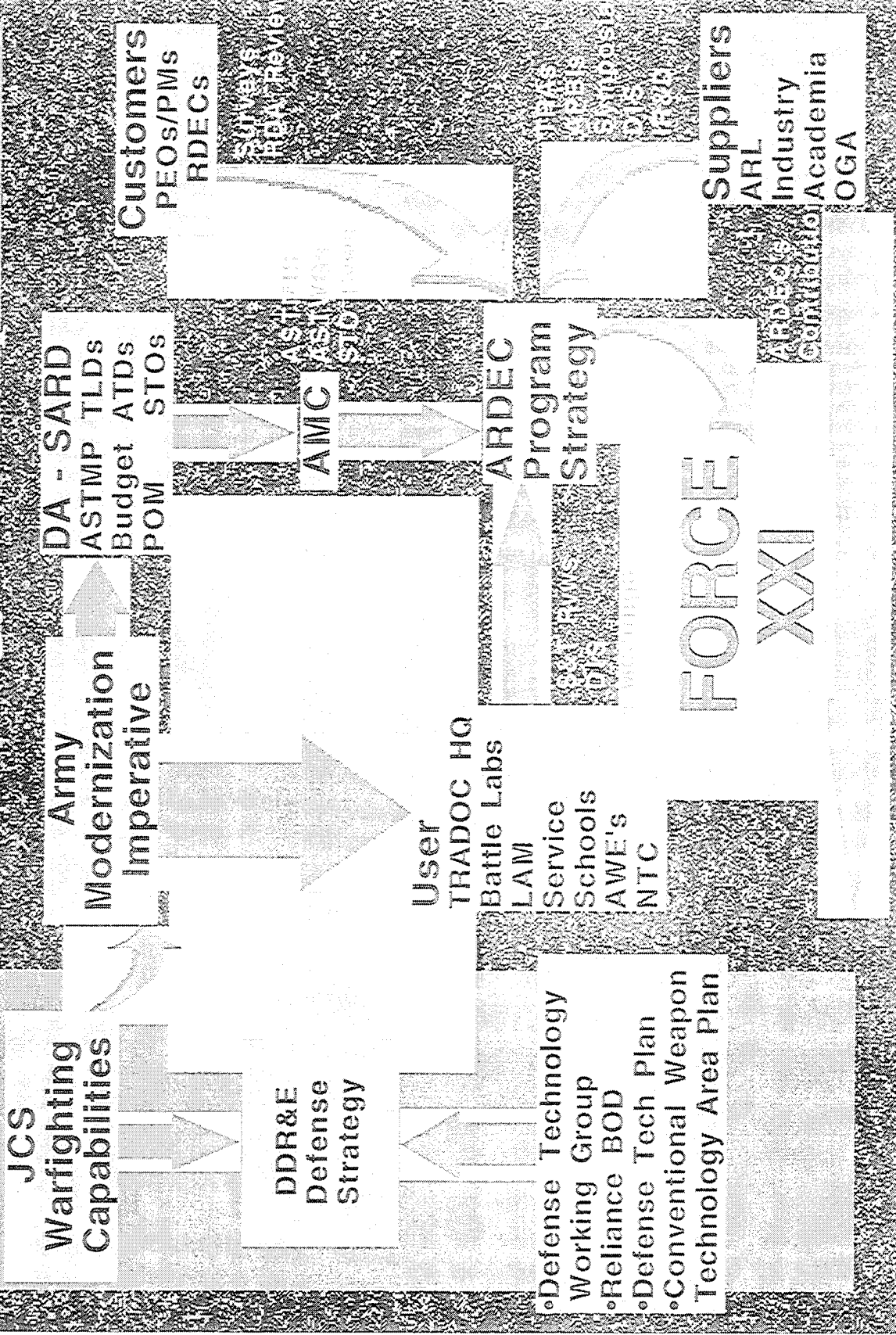
Assembly & Operations



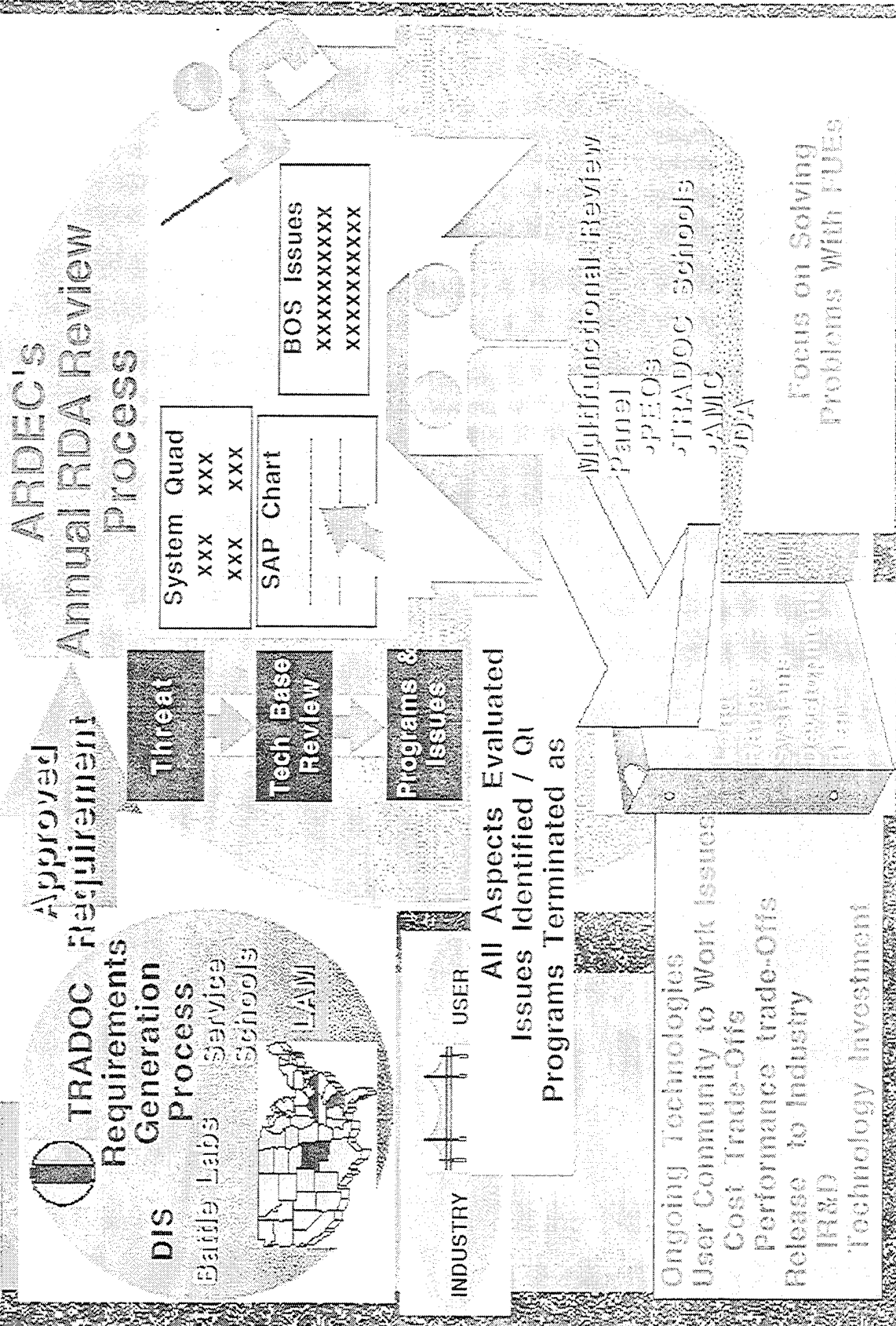
Support & Logistics



ARDEC Strategy Development

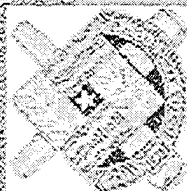


Strategy Development



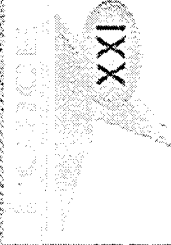
Spooky Things





Direct Hit Accuracy

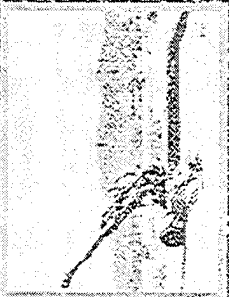
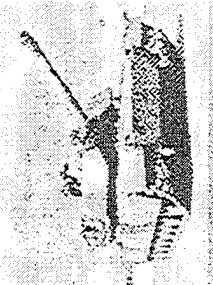
Direct Hit Accuracy



Direct Hit Accuracy

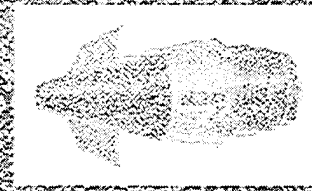


Direct Hit Accuracy

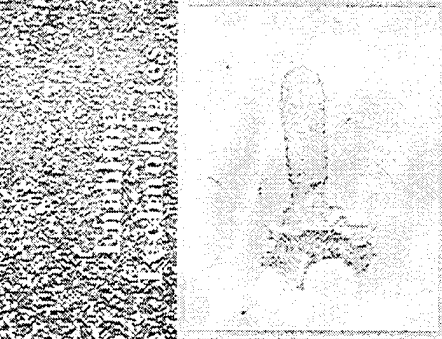


Direct Hit Accuracy

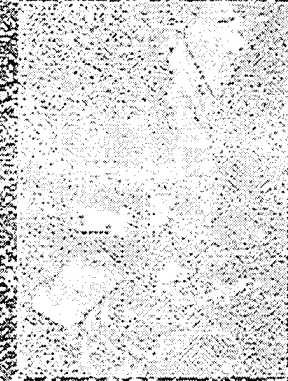
ARDTC'S Thrust Areas



Direct Hit Accuracy



Direct Hit Accuracy



Direct Hit Accuracy



Direct Hit Accuracy

List of ARDEC Technology Thrusts and Thrusts Leaders

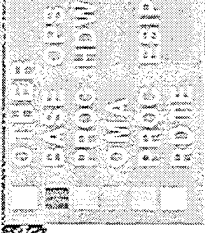
- Direct Fire
- Indirect Fire
- Rapid Force Projection
- Rapid/Digitized Fire Mission
- Sustainment and Survivability
- Innovative Weapons Concepts
- Enabling Technologies
- Environmental

Carl Beaulieu, COAC 5465
 Al Warrasch, FSAC 6206
 Jeff Dyer, FSAC 4707
 Walt Ryba, FSAC 7959
 Gary Kent, DALA 2170
 Carl Beaulieu, COAC 5465
 Ray Blajda, AED 4636
 Bob Scola, IEC 2004

All Telephone Numbers Area Code 201 724-XXXX

Revenue Outlook

Total Revenue



Long Range Funding Impact by Business Area

- Growth Areas
 - Direct Fire
 - Fuze & Lethal Mechanism
 - Munitions Survivability

- Steady State Areas
 - Smart Munitions
 - Soldier Weapons
 - Fire Control

- Slightly Declining
 - Indirect Fire
 - Gun Propulsion

| | FY94 | FY95 | FY96 | FY97 | FY98 | FY99 |
|----------|------|------|------|------|------|------|
| Other | 34 | 25 | 35 | 34 | 33 | 33 |
| Base Ops | 43 | 42 | 44 | 44 | 44 | 44 |
| Prog HdW | 179 | 147 | 111 | 137 | 137 | 137 |
| OMA | 50 | 65 | 59 | 63 | 63 | 63 |
| ESIP | 105 | 74 | 54 | 57 | 57 | 57 |
| RDTE | 282 | 268 | 234 | 240 | 240 | 240 |
| Total | 632 | 612 | 536 | 574 | 502 | 502 |

Innovative Weapon Concepts Thrusts Non-Lethal Munitions

Goals

- Weaponize technologies that will collateral damage/non-lethal munition options
- Emphasis on military operations

provide users with low
munition options
other than war (OOTW)

Key Programs

- Low Collateral Damage Munitions
- Non-Lethal Marker Munition (W/ARL BRDRC) (STO)

User Linkage

- Dismounted Battlespace Battle Lab
- Military Police
- Special Operations Command
- Early Entry Lethality Survivability
- FBI/Law Enforcement Agencies

Sustainment and Survivability Thrust

Goals

- Reduce weapon system reach times
- Apply state-of-the-art technologies to ammunition packaging
- Enhance explosive safety
- Improve strategic and battlefield survivability through other containerization, simulation, MHE, asset tracking and other technologies

Key Programs

- Logistics Survivability (STO)
- Munitions Survivability Technology (STO)
- Future Munitions Packaging Technology

User Linkage

- Combat Service Support Battle Lab
- Mobile Strike Force
- Advanced Warfighting Experiment
- Aviation and Troop Command



Enabling Technology Thrust



Goals

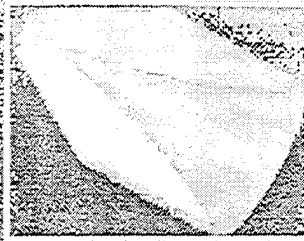
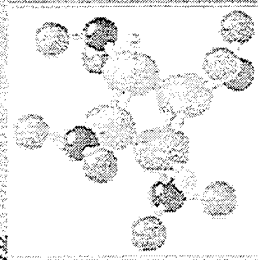
- Improve Warhead Lethality (25% increase in armor penetration over SADARM type warhead)
- 10% more powerful yet less sensitive energetic materials
- Provide kill mechanism for direct fire lethality program

Key Programs

- Anti-Armor Materials (Joint STO w./ARL)
- Energetic Material and Warheads (STO)
- Warheads for Armor Defeat (STO)
- Polynitroethane Explosives (STO)
- High Energy/High Performance Propellant Formulation for Tank Guns (STO)

User Linkage

- Linked through armament system thrusts

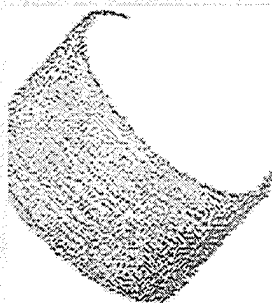
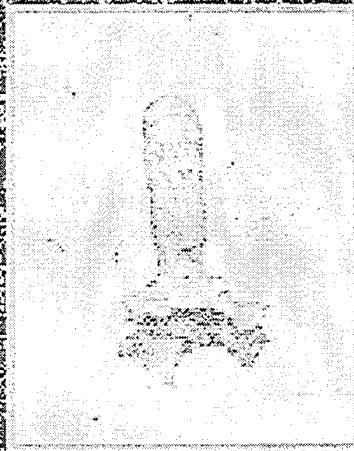


Enabling

- Explosively Formed Penetrators

- Laser Ignition

- Insensitive Munitions & High Performance Explosives

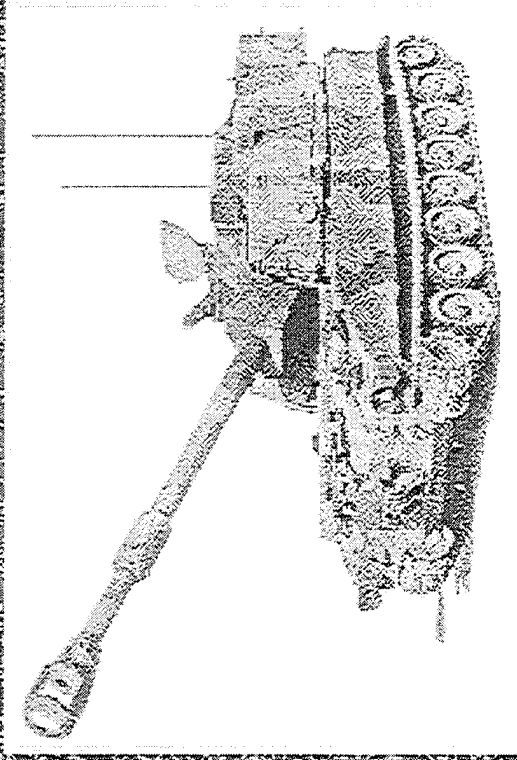


- Used In Major Systems For Top Attack
- ARDEC Recognized As World Leader in EFP Technology

- Achieved A 50% Increase In Armor Penetration

Enabling Technologies

- Explosively Formed Penetrators
- Laser Ignition
- Insensitive Munitions & High Performance Explosives



Revolutionary New Approach For
Propellant Ignition

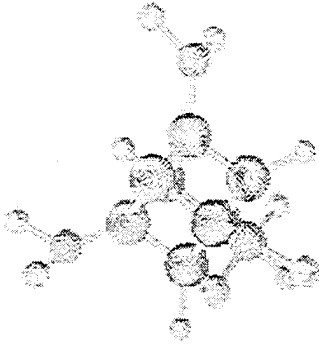
- A Complete Laser Ignition System Was Successfully Integrated And Tested In The M109A6 Paladin SP Howitzer

Enabling Technologies

- Explosively Formed Penetrators

- Laser Ignition

- Insensitive Munitions & High Performance Explosives



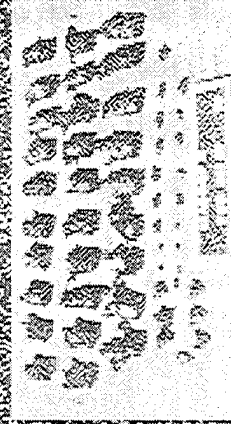
- PAXHA To Be Qualified For 25mm Ammunition

- First Army I/M Explosive

I/M Rounds After Burn



Sig. Rounds After Burn



ARDTC Technology for the Future

ARMOR

- ERA Defeat
- Extended Range
- Gun/Ammo Dynamics
- Light Sabot

ADV KE Cartridge
M829A2/A3 &
GUN

- ERA Defeat
- Extended Range

STAFF/
X-ROD

- Increased
-Ph
- Crew Safety
- Lower L/C Costs

Adv Turret Drives &
Weapon
Stabilization

- 360 Vision Sight
- Compact A/L

Adv Light
Intelligent
Armament System

- Increase Firepower
- More Kills/Load

Advanced Light
Armament for
Bradley



M1A1



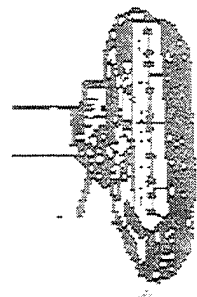
M1A1.5



M1A3



FMBT



05 06

95 96 97 98 99 00 01

Defeat Of Enemy Armor

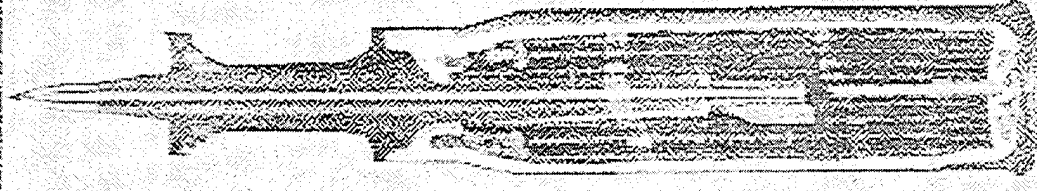
Kinetic Energy Technologies

- M829 A2
- XM829 E3
- XM829 E4

Embedded To The
Troops

Features:

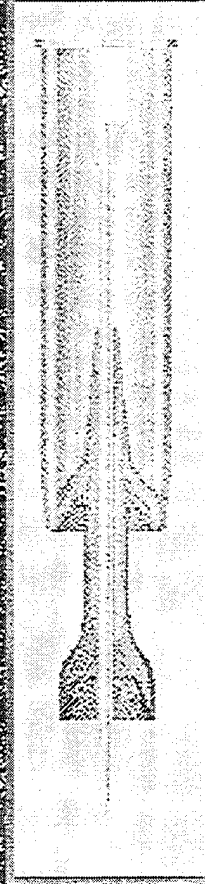
- Composite Sabor
- Super DU Penetrator
- Kevlar Propellant



Defeat Of Enemy Armor

• Kinetic Energy Technologies

- M829 A2
- **XM829 E3**
- XM829 E4



Features:

- High L/D Penetrator
- High Density Propellant
- Greater Velocity & Penetration

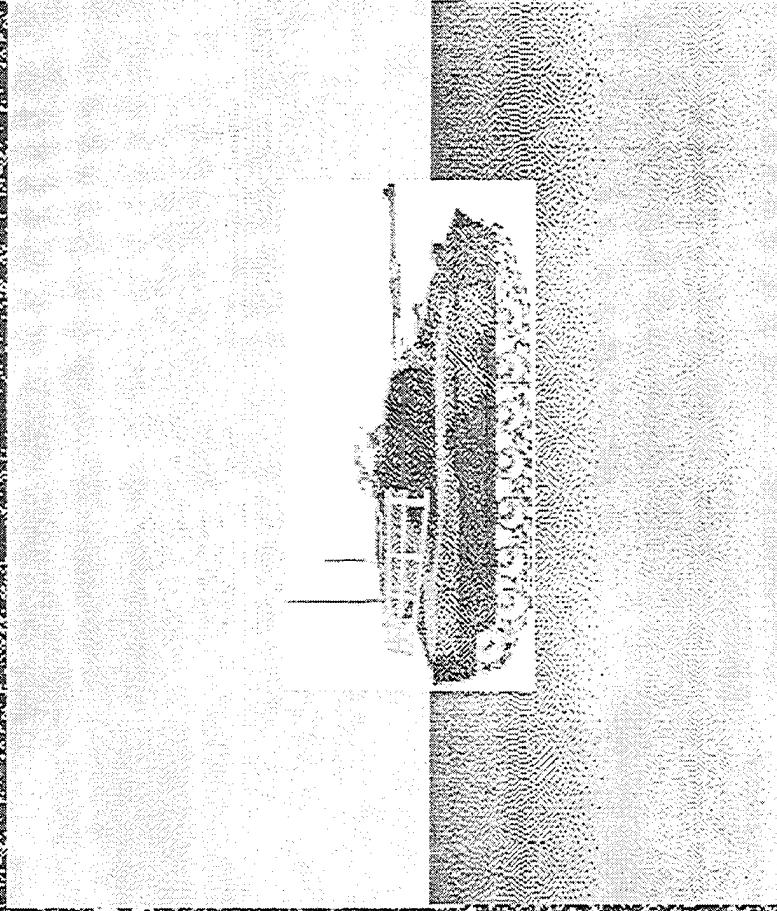
Defeat Of Enemy Armor

• Kinetic Energy

• M829 A2

• XM829 E3

• XM829 E4



Features:

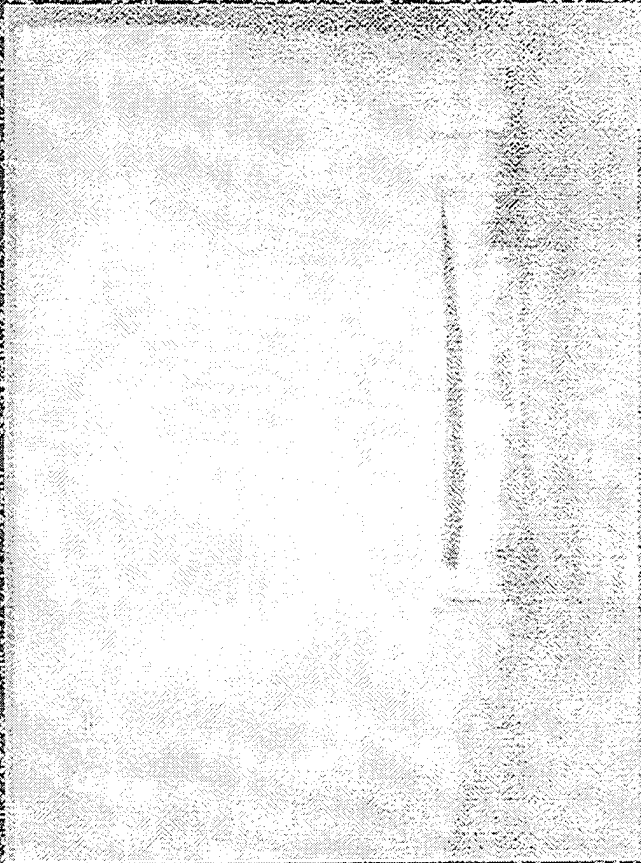
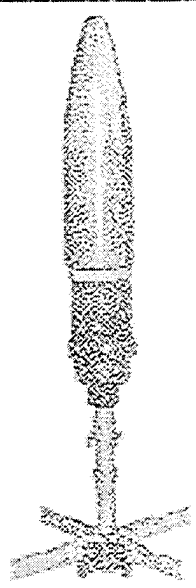
• Innovative RA Precursor Technology

Defeat Of Enemy Armor

- Smart Systems

- **START**

- X-ROD



Successfully Completed Both
System Integration and
Warhead Cover Release Testing
in Dynamic Environments

Defeat Of Enemy Armor

- Smart Systems

- STAFF

- X-ROD

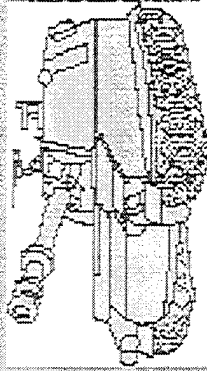
RD25

- Demonstrated in Flight Maneuverability
- Successfully Completed Battery And Telemetry Testing



ARDDC Technology for the Future

ARTILLERY



PALADIN

XM982

50km Range
BASEBURN & ROCKET
XM130 (35aa)
HIGHER PERFORMANCE
ROTATING BANDS

IMPR. ACCURACY
APPLIED TO STOCKPILE
GPS

155mm
FIRE & FORGET
STOP ATTACK EFF.

UN-COOLER IR/LADAR
MICRO MOTORS/GPS
DIGITIZED FIRE
CONTROL

ELECTRONIC
UNCR. RELIABILITY
REDUCED DUDS

LCCM

SADARM

SMART MUNITIONS,
FIRE CONTROL & RAPID
REARM/RESUPPLY

SELF-DESTRUCT
(SD) FUZE (105mm
and MLRS)



CRUSADER



ESTIMATE XXI



MLRS



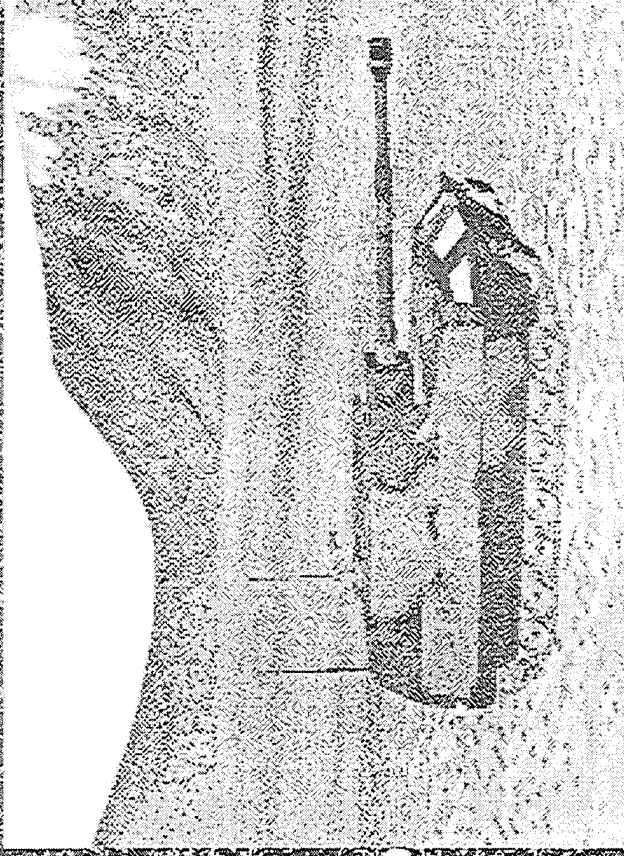
NAVY
155mm /

95 96 97 98 99 00 01 02 03 04 05

Indirect Fire Lethality

• Crusader

- XM982 Extended Range Artillery
- Low Cost Competent Munition
- SADARM
- Self Destruct Fuze



- Increased Survivability, Mobility, Range and Accuracy
- Multiple Round Simultaneous Impact (MRSI) Capability
- Reduced Crew Size (4-3) & Time of Deployment

Indirect Fire Lethality

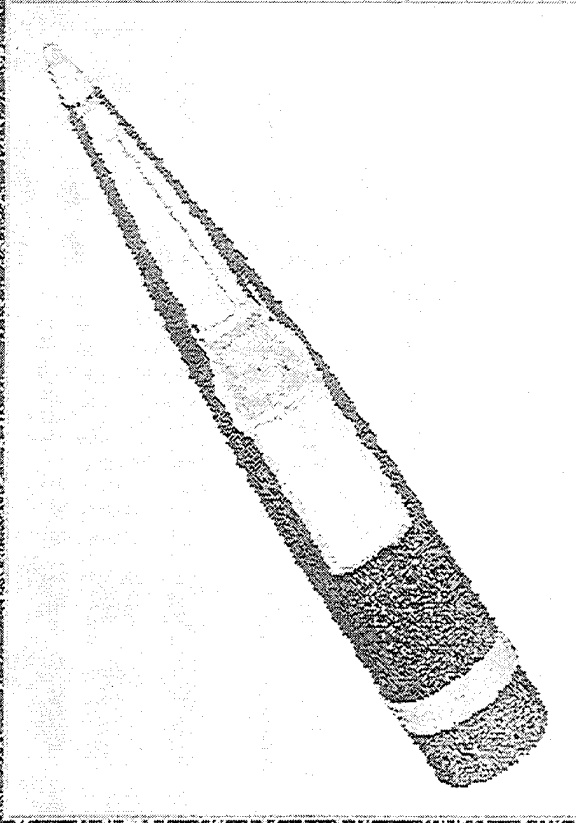
- Crusader

- XM982 Extended Range Artillery

- Low Cost
Competent Munitions

- SADARM

- Self-Destructive Fuze



- Successfully Completed Static And Dynamic Flight Testing
- More Than 35% Increase In Range—to 50Knm

Indirect Fire Lethality

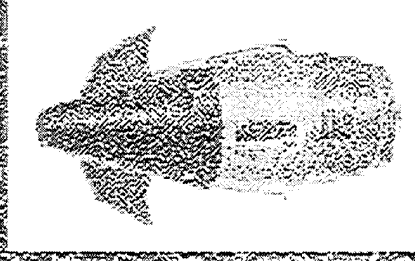
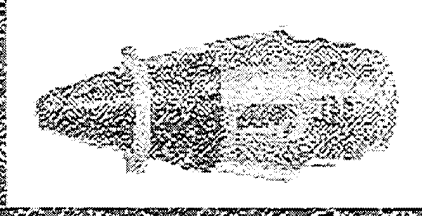
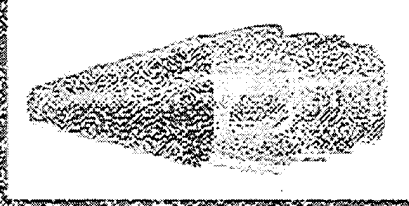
- Crusader

- XM982 Extended Range Artillery

- Low Cost Competent Munitions

- SADARM

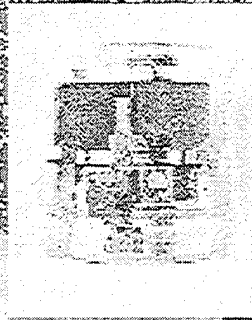
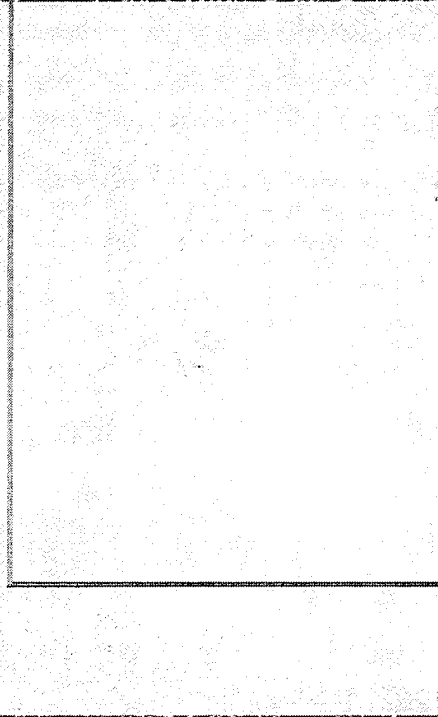
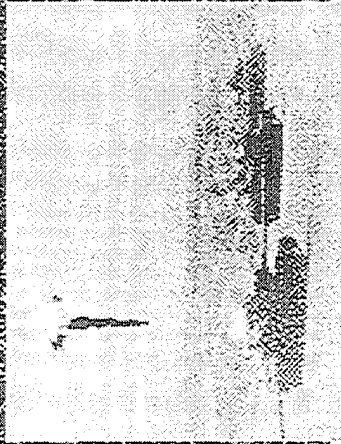
- Self Destruct Fuze



- Completed 2 Proof Of Principle Test Firings Of GPS-Aided Registration Modules
- Extrapolated Impact Point To Within 40m Of Actual Impact

Defeat Of Enemy Armor

- Crusader
- XM982 Extended Range Artillery
- Low Cost Competent Munitions
- **SADARM**
- Self Destruct Fuze



Defeat Of Enemy Armor

• Crusader

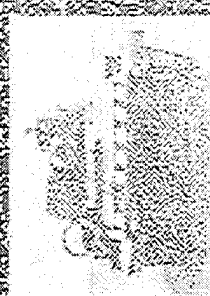
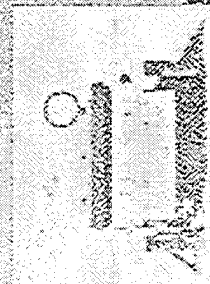
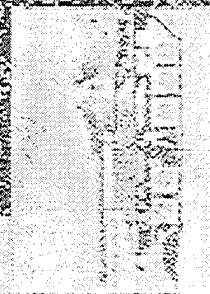
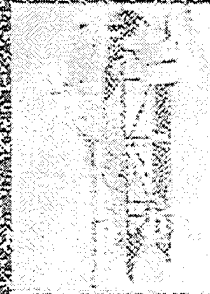
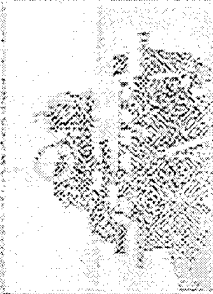
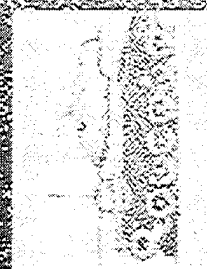
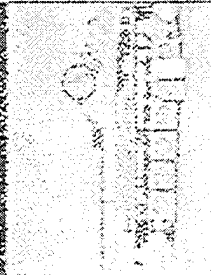
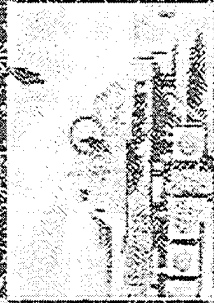
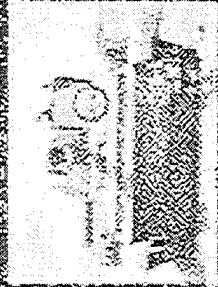
• XM982 Extended
Range Artillery

• Low Cost
Competent Munitions

• SADARM

• Self Destruct Fuze

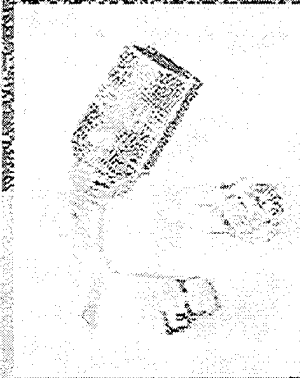
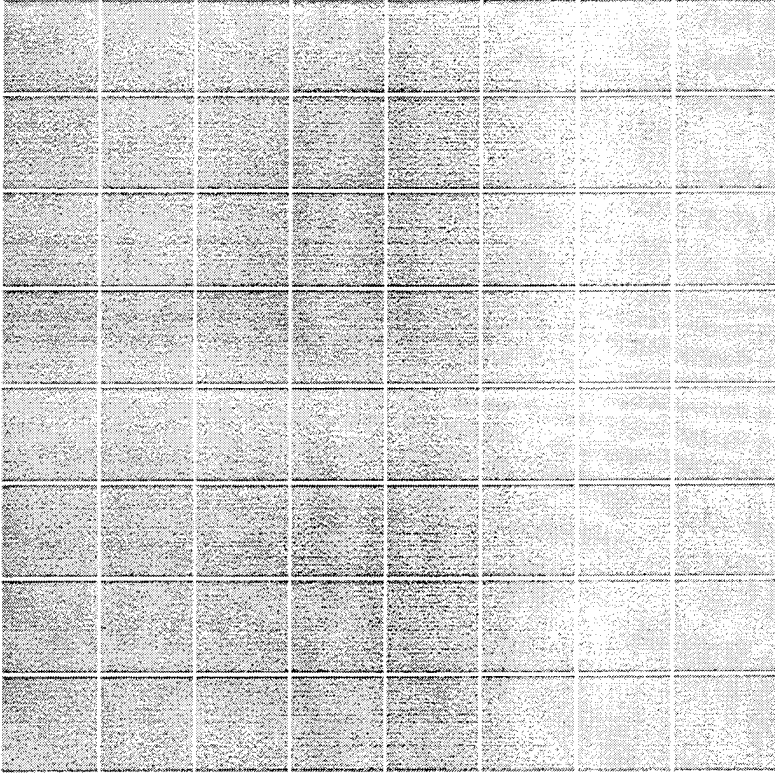
Thirteen Lanyard Pulls
Eleven Targets Hit



Indirect Fire Lethality

- Crusader
- XM982, Extended Range Artillery
- Low Cost Competent Munitions
- SADARM
- Self Destruct Fuze

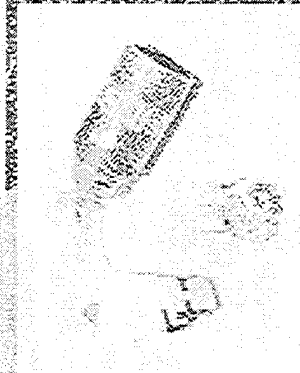
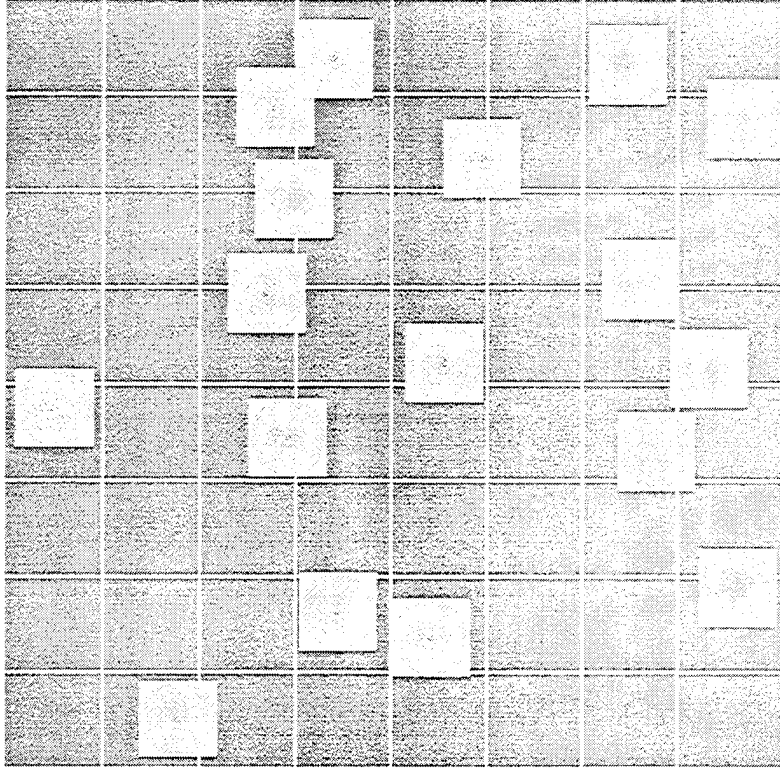
Six Direct MRS



Indirect Fire Lethality

- Crusader
- XM982 Extended Range Artillery
- Low Cost Competent Munitions
- SAIDARM
- Self Destruct Fuze

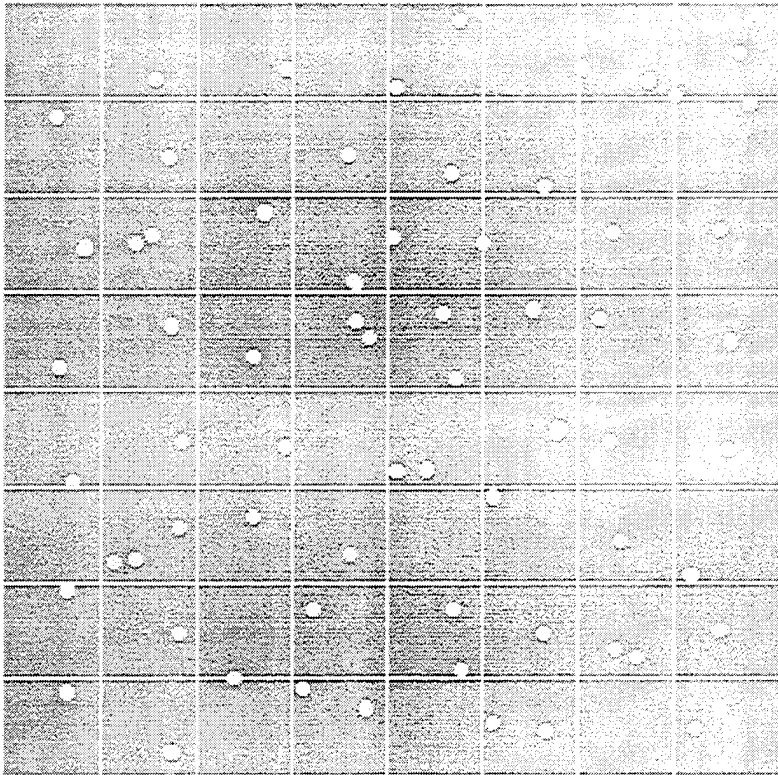
Six Pack M829



Indirect Fire Lethality

- Crusader
- XM982 Extended Range Artillery
- Low Cost Competent Munitions
- SADARM
- Self Destruct Fuze

Six Pack Missiles



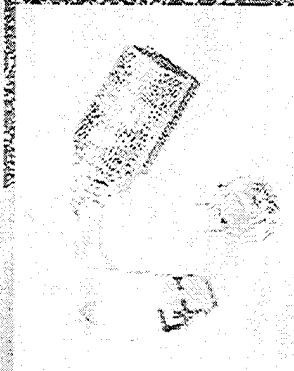
Over 300 Duds on Battleground



Indirect Fire Reliability

- Crusader
- XM982 Extended Range Artillery
- Low Cost
- Competent Munitions
- SAIDARM
- Self Destruct Fuse

Self-Destructs Rize reduces this number to approx. 5.



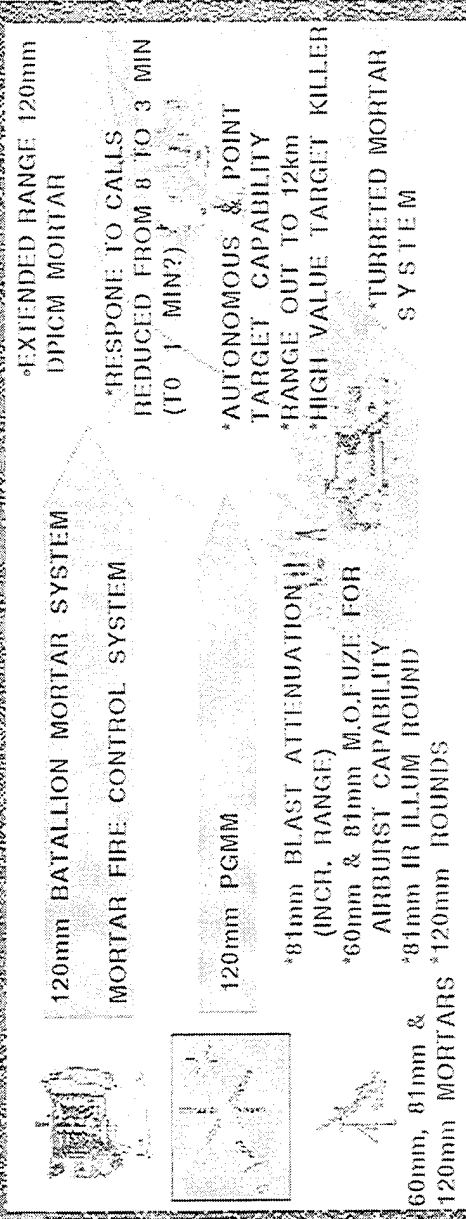
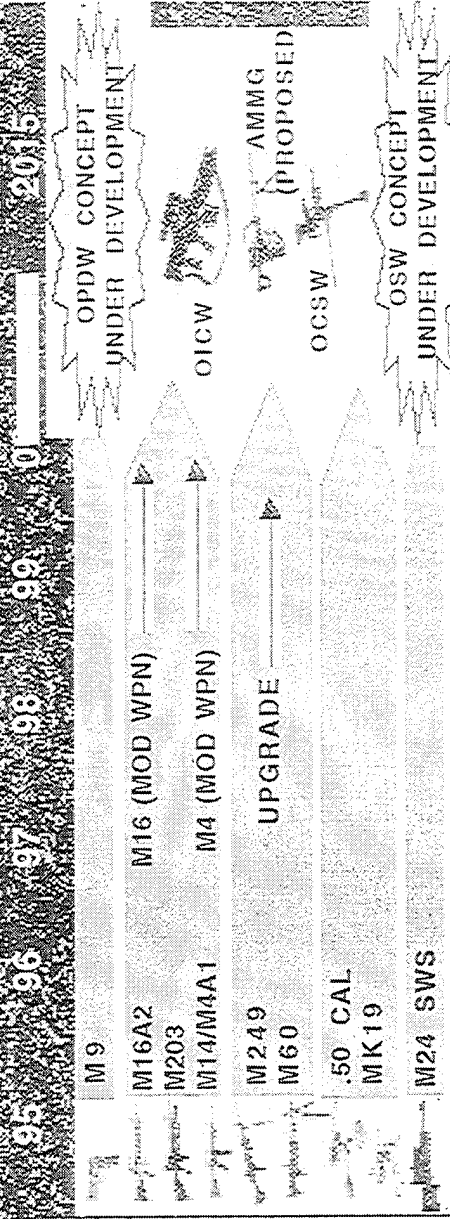
ARDEC Technology for the Future

INFANTRY

IMPROVED AMMO
 -AP - 5.56, 7.62, .50 Cal
 -PRECISION BURSTING
 -AGGREGATORS
 -OPTICS-DAY/NIGHT
 -SCOPES-LASER HARDENED
 MODULAR FIRE CONTROL
 -LASER RANGE FINDER
 -BALLISTIC COMPUTER
 ADV SUPPRESSION SYS
 MODULAR SYS DEV
 ADAPTORS/BRACKETS

DIGITIZED FIRE CONTROL
 -ON-BOARD BALLISTICS
 -ON-BOARD GPS/POS/NAV
 PGMM DEVELOPMENT
 -IR/IMVW SENSOR
 -LASER DESIGNATOR

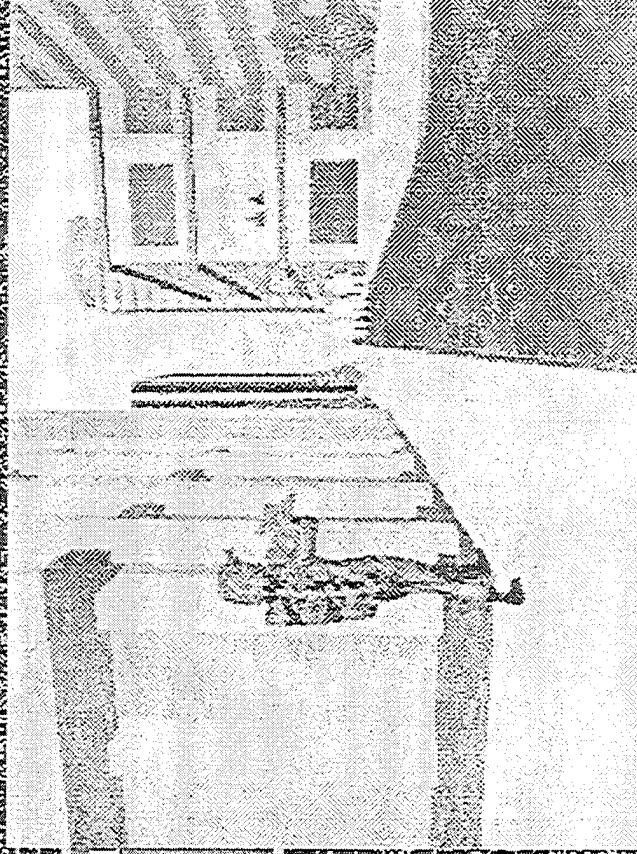
FIELD
 ENHANCEMENTS



Direct Fire Thrust

- Objective Individual Combat Weapon (OICW)

- Objective Crew Served Weapon (OCSW)



- New Smart Advanced Technology Demonstrator (A1D)
- Demonstrated Laser Ranging, Fuzer Miniaturization and Warhead Lethality

Direct Fire Thrust

- Objective Individual Combat Weapon (OICW)

- Objective Crew Served Weapon (OCSW)



- Completed Phase I Competitive Trade Studies
- Phase II's On Course

Infantry (RFPD)

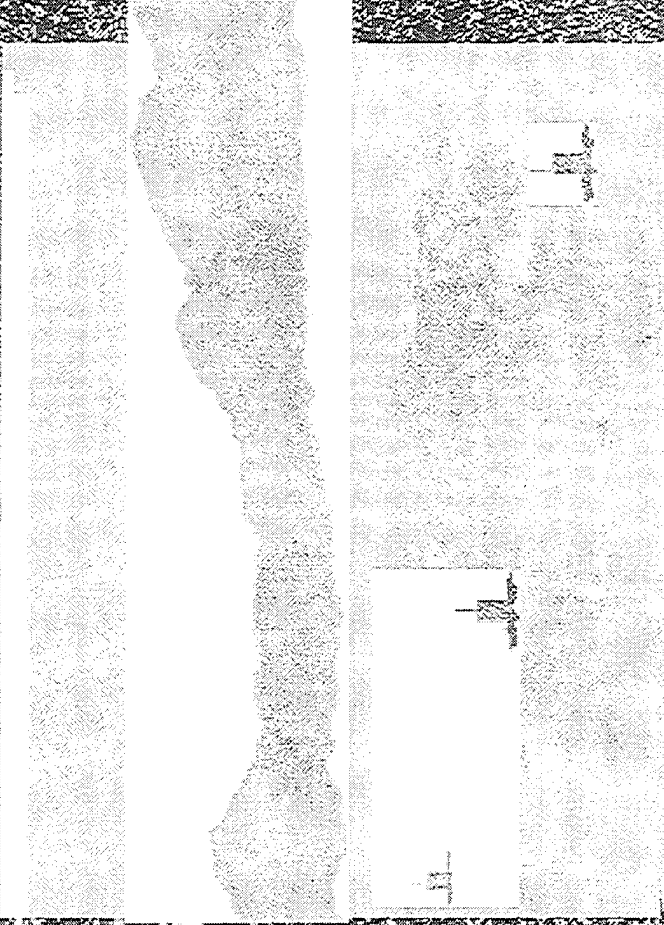
- Precision Guided Mortar Munition (PGMM)



- Demonstrated Live Fire Testing Of Two Foreign Smart Mortars

Rapid Force Projection Initiative

- Intelligent Minefi



- Demonstrated Operational Effectiveness Of Acoustic Overwatch Sensors

Rapid Force Projection Initiative

- Intelligent Minefield



- Live Fire Test - Successfully
Destroyed A Moving T80 Tank

The Future-Tech Base Programs

ITEMS

EXPECTED
YEAR OF
TRANSITION

| | |
|---|-----------|
| • Objective Individual Combat Weapon* | 1999 |
| • Objective Crew Served Weapon* | 2001 |
| • XM982, Extended Range Artillery Projectile (ERA)* | 1998 |
| • Low Cost Competent Munitions* | 1998 |
| • Light Weight Automatic Howitzer/Advanced Towed Cannon Artillery System* | 1996/1999 |
| • Precision Guided Mortar Munitions* | 1998 |
| • Intelligent Minefield (WAM) | 1998 |
| • X-ROD* | ? |

* dependent upon technical success & funding availability

Items Type Classified TY96

New Opportunities

ITEMS

6 YEAR
FY96
VALUE
(FY96-FY01)

• XM130, Mortar Ballistic
Computer

• Wide Area Munition

• XM191/15/9/16, 105mm
DPICM

• M796, 155mm

• M116 Rifle Mod (Optics)

CITE/LITTON COMPUTER

TEXTRON DEFENSE SYSTEMS

CHAMBERLAIN/KDI/AMRON

IOWA/CHAMBERLAIN/THIOKOL

AIMPOINT/THUON

\$18.9

149.2

142.3

55.4

12.9

\$5.0

14.6

0

55.4

2.8

* dependent upon technical success & funding availability

Krems Type Classified RY96

New Opportunities

(CONTINUED)

ITEMS

DEVELOPER

RY96
VALUE

6-YEAR
VALUE

(FY96-FY01)

| | | | |
|---|------------------------|---------|---------|
| XIM929E1 Mortar 120mm (M734E1 Multi Option Fuze (V/XIM(M929E1)) | LOCKHEED MARTIN KDI | 87.7 | 147.7 |
| XIM980/983 Ctg. Mortar 120mm Illum/IR Illum | PINE BLUFF/CRANE | 0.0 | 24.0 |
| XIM981 Ctg. Mortar 120mm Full Flange Trainer | POCAL INDUSTRIES | 18.8 | 281.3 |
| XIM816E1 Ctg. 81mm Mortar IR Illum (USMC) | THIokol | 4.7 | 9.5 |
| XIM767 Ctg. Mortar 60mm IR Illum | CRANE/PINE BLUFF | 10.6 | 30.0 |
| M4 Carbine Optics | TBD | 9 | 17.9 |
| | TOTAL | \$185.0 | \$739.3 |

Maintain World Class Industrial Base for Equipping Force XXI

- ARDEC Facilities Available For Industry Use
Testing / Laboratories / Instrumentation / Distributed Interactive Simulation (DIS)
- Science and Technology Dollars for Armaments
- Environmental \$27.1M

| TRADOC Battlefield Operating System | (\$M) FY97 |
|--|---------------|
| Fire Support | 86.6 |
| Maneuver (Mounted) | 190.9 |
| Maneuver (Dismounted) | 82.0 |
| (Counter) Mobility | 32.6 |
| Combat Service Support | 23.6 |

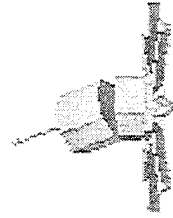
64% Available
For Contracts



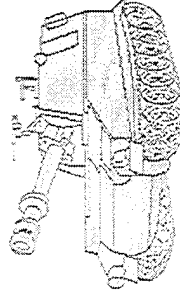
Mounted Operations



Combat Service Support



Mobility/Counter



Fire Support



Dismounted Operations

AIRDEC's Strategic Plan For The Future

21st Century Warfare

- Protect the Force
- Execute Precision Strikes
- Win The Information War
- Project & Sustain Combat Power
- Dominate Maneuver

Logistics

- Insensitive Munitions
- Munitions Survivability
- Rapid Replenish/Resupply



Armor, Infantry, SOF



- Armor
- Top Attack Capability
- Increased P-Hit
- Smart Actuators & Gearless drives



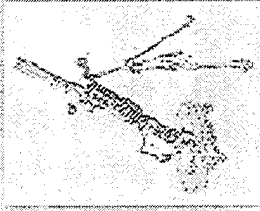
- Infantry & SOF
- Bursting Munitions
- Selectable Munitions
- Cyber Stable Binoculars

Artillery

- 60% Range Increase
- 400% Rate Of Fire Increase
- 33% Manpower Reduction
- Increased Mobility
- Autonomous

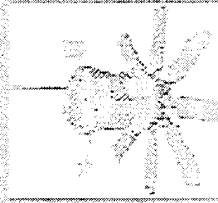


Infantry, Engineers



- Minotaur
- Balanced Mobility
- Balanced Fire Control
- Extended Range
- Precision Guided

- Hard Mine Warfare
- WAMI
- IME



Mr. Carmine Spinelli
ARDEC Technical Director

Phone: Commercial (201) 724-7012/7013

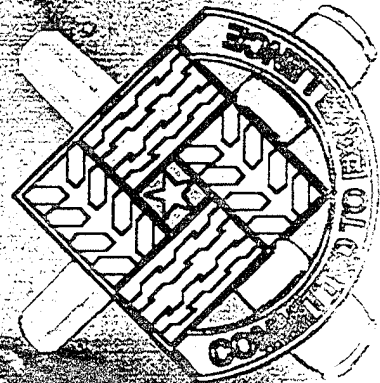
DISN 330-7012/7013

Mailing Address: US ARMY ARDEC

AMSTA-AR-TD, Bldg. 1-4th Fl.

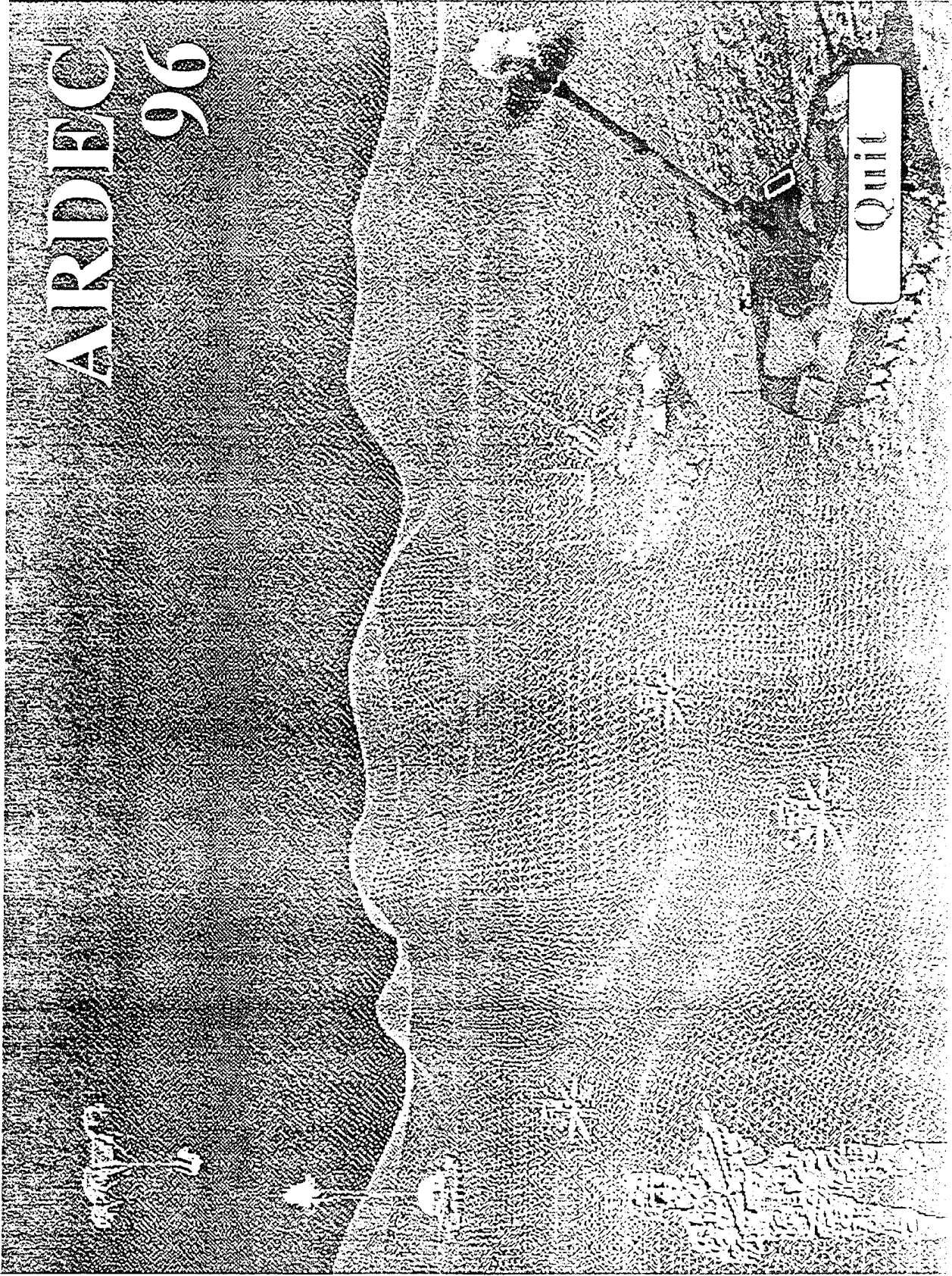
Picatinny Arsenal, NJ

07806-5000



ARDEC 96

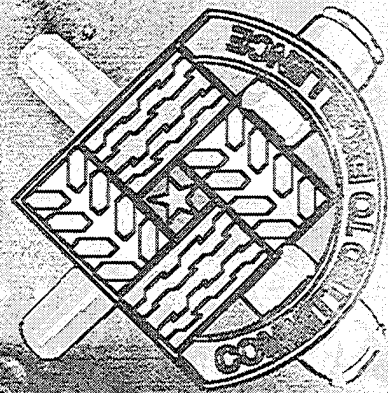
Quil



Mr. Carmine Spinelli
ARDEC Technical Director

Phone: Commercial (201) 724-7012/7013
DSN 330-7012/7013

Mailing Address: US ARMY ARDEC
AMSTA-AR-TD, Bldg. 1-4th Fl
Picatinny Arsenal, NJ
07806-5000

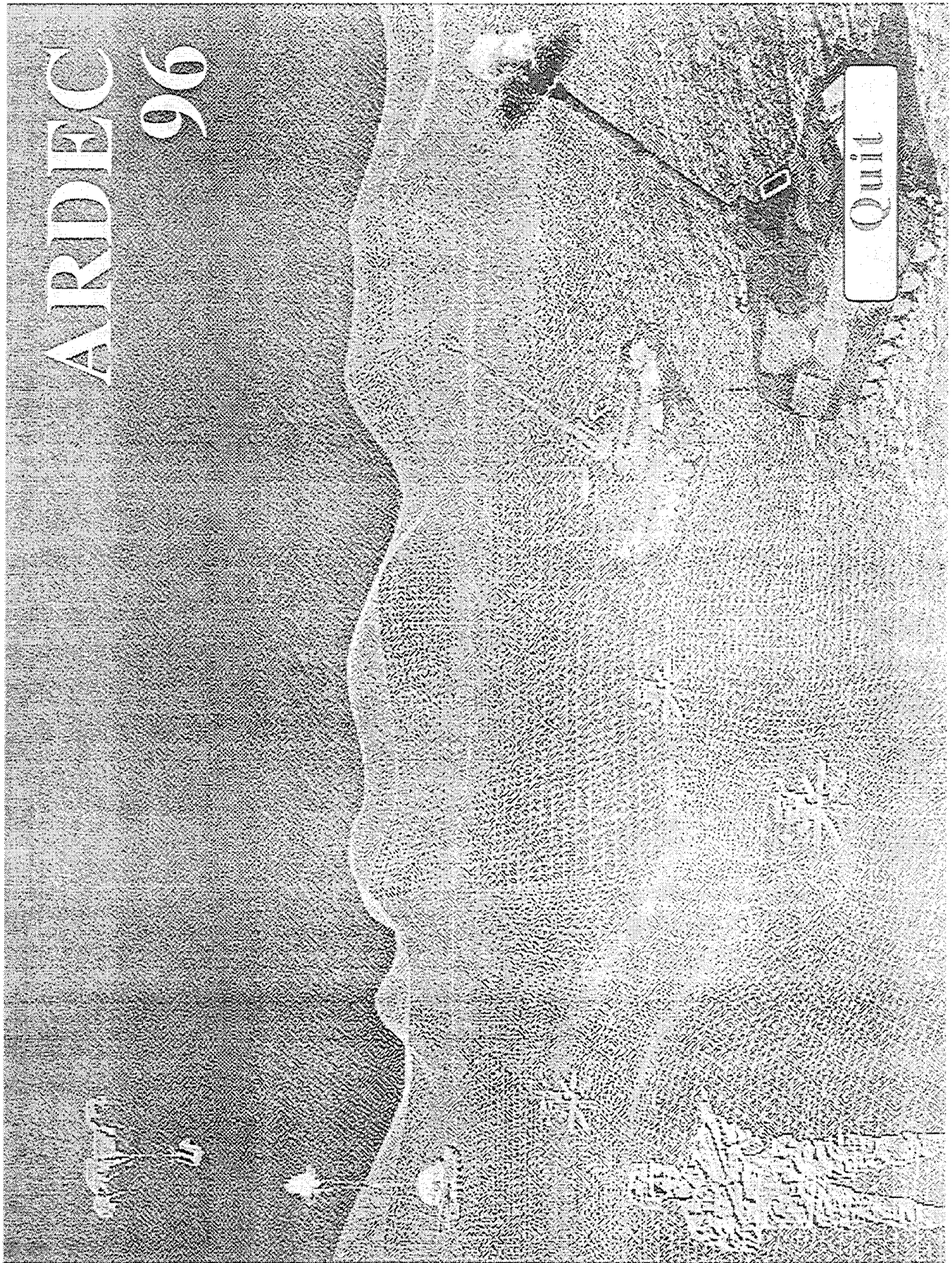


Thank You!

ARDEC

96

Quit



Performance Specifications

IMPACT ON ARMAMENTS ACQUISITION

IOC APBI
1-3 APR.'96

SPENCER HIRSHMAN
TACOM / ARDEC

ADPA

Dr. Perry Statement

■ "TO MEET FUTURE NEEDS, THE DEPARTMENT OF DEFENSE MUST INCREASE ACCESS TO COMMERCIAL STATE-OF-THE-ART TECHNOLOGY AND MUST FACILITATE THE ADOPTION BY ITS SUPPLIERS OF BUSINESS PROCESSES CHARACTERISTIC OF WORLD CLASS SUPPLIERS."

Dr. Perry Statement (cont.)

- THE INTEGRATING OF COMMERCIAL AND MILITARY DEVELOPMENT AND MANUFACTURING FACILITATES THE DEVELOPMENT OF DUAL-USE PROCESSES AND PRODUCTS AND CONTRIBUTES TO AN EXPANDED INDUSTRIAL BASE THAT IS CAPABLE OF MEETING DEFENSE NEEDS AT LOWER COSTS."

Performance Spec Defined

- PERFORMANCE SPECIFICATIONS
DEFINE THE FUNCTIONAL
REQUIREMENTS FOR AN ITEM, THE
ENVIRONMENT IN WHICH IT MUST
OPERATE, AND ALL INTERFACE
AND INTERCHANGE
CHARACTERISTICS

Performance Specification

Definition (Cont.)

- A COMPILATION OF ALL QUANTIFIABLE CHARACTERISTICS WHICH DEFINE WEAPONS/MATERIEL SYSTEM FUNCTIONAL REQUIREMENTS [E.G. FORM, FIT, FUNCTION, PERFORMANCE, AND INTERFACES]. IT STATES ITS REQUIREMENTS IN TERMS OF THE REQUIRED RESULTS WITH CRITERIA FOR VERIFYING COMPLIANCE, BUT WITHOUT STATING THE METHODS FOR ACHIEVING THE REQUIRED RESULT

How Is Performance Spec. Policy Being Implemented?

- DoD
ALL ACAT programs for new systems,
major modifications, technology generation
changes, nondevelopmental and
commercial items
- NAVY & AIRFORCE
 - In Compliance with DoD Policy
- ARMY
 - ALL Solicitations (as applicable MAP)
including non ACAT programs, services,
rebuys of ACAT systems, replenishments &

Ammunition Performance Specification Considerations

- [1] Safety hazard, less than 1 chance per 1,000,000 opportunities
- [2] Interoperability-NATO, inter service, inter weapon system operational behavior [examples are: ballistics which are consistent with fire control computers; communication protocols; RSI agreements]
- [3] Shelf life and Demil- for items which DoD will eventually bear the responsibility of inventory maintenance and end- of- useful- life disposition
- [4] EOD - explosive ordnance disposal

Implications of Performance Specifications on Acquisition

- Use of performance specifications in reprocurement, replenishments, procurement of Spares
 - SUPPORTS LONG TERM PARTNERING RELATIONSHIPS
 - SOLE SOURCE PROCUREMENTS
 - REDUCES GOV'T INVOLVEMENT IN CONFIGURATIONAL CONTROL
 - FUNCTIONAL AND PERFORMANCE LEVEL REQUIREMENTS ONLY

Performance Spec Environment

■ GOVERNMENT TDP

- UPDATE AND CERTIFY FOR PROCUREMENT*
- PROVIDE TO OFFERORS AS ADVISORY
- OFFER HARDWARE SAMPLES FOR TEARDOWN / EVALUATION

■ CONTRACTOR TDP

- CONTRACTOR REQUIRED TO BASELINE A TDP OF HIS CHOICE FOR PRODUCTION
 - MUST SATISFY PERFORMANCE REQUIREMENTS AND INTERFACE STANDARDS
 - MUST MAINTAIN TDP
 - MUST PROVIDE CONFIGURATION MANAGEMENT
- BASELINE TDP AUDITED PRIOR TO FIRST ARTICLE TESTING
- GOV'T. USES TDP TO SATISFY PRODUCT OWNERSHIP NEEDS AND MAY USE AS ADVISORY PACKAGE FOR FUTURE BUYS WITH APPROPRIATE LICENSE

*MIL SPEC REFERENCES NEED NOT BE PURGED FROM TDP AS THEY ARE ADVISORY

THE ROLE OF DRAWINGS

- PERFORMANCE SPECIFICATIONS DEFINE CUSTOMER REQUIREMENTS
- DRAWINGS DEFINE PRODUCTS, SYSTEMS AND THE SUPPORTING INFRASTRUCTURE
- DRAWINGS MUST BE CREATED AND MAINTAINED TO CONTROL AND DOCUMENT THE LIFE CYCLE OF MATERIEL
 - THEY ARE A NECESSARY EXPENSE TO PROGRAMS
 - HOWEVER, OWNERSHIP AND MAINTENANCE WILL VARY BY THE PRODUCT AND CIRCUMSTANCES

THE ROLE OF DRAWINGS

- DRAWINGS ARE REQUIRED TO PROVIDE;
 - A FOUNDATION FOR STANDARDIZATION
 - DOCUMENTATION AND VALIDATION OF DESIGN AND ENGINEERING
 - INFORMATION TO DESIGNERS AND MANUFACTURERS
 - CONTROL OF PROTOTYPES, PRODUCTION AND MAINTENANCE
 - BASIS FOR SIGNATURES TO AUTOMATED EQUIPMENT AND PROCESSES
 - CONTROL OF INTERFACES BEYOND THE CAPABILITY OF WRITTEN STANDARDS
- DOCUMENTED CONFIGURATION HISTORY OF PRODUCT
- FACTUAL INFORMATION FOR ANALYSES, STUDIES AND INVESTIGATION
- LEGAL SAFE GUARDS
- INDUSTRIAL PREPAREDNESS
- DEMILITARIZATION/DISPOSAL

THE ROLE OF DRAWINGS

- INDUSTRY USES DRAWINGS WITH PERFORMANCE SPECIFICATIONS

JOHN DEERE

- "WE ARE USING PERFORMANCE SPECIFICATIONS TO BUY NEW SUBSYSTEMS"
- "WE OBTAIN THE DRAWINGS IF POSSIBLE" FOR SPARE PARTS MANUFACTURE

SEARS

- MOST PRODUCTS ARE BOUGHT TO PERFORMANCE SPECIFICATIONS BUT IF THEY'RE BUYING SHOES FROM A DEVELOPING COUNTRY THEY APPROVE THE PRODUCT AND THE PRODUCTION PROCESSES, "A SHOE MUST LOOK AND PERFORM LIKE A SHOE."
- SAFETY REQUIREMENTS ARE VERIFIED IN INDEPENDENT LABORATORIES

THE ROLE OF DRAWINGS

■ SEARS (CONT'D)

- DRAWINGS ARE GENERALLY RETAINED BY SUPPLIERS BUT SPARE PARTS ARE REVERSE ENGINEERED/RE-ENGINEERED BY SEARS TO REDUCE

COST

- GOVERNMENT MUST HAVE ACCESS TO DRAWINGS / OTHER TECHNICAL DATA DEVELOPED AT CONTRACTOR EXPENSE UNDER PERFORMANCE SPECIFICATIONS TO SATISFY:
 - OWNERSHIP NEEDS DURING LIFE OF PRODUCT
 - STANDARDIZATION
 - INDUSTRIAL PREPAREDNESS
 - NATIONAL SECURITY NEEDS

THE ROLE OF DRAWINGS

- RECOMMEND CONTRACTS PROVIDE FOR
 - ROYALTY FREE USE OF DRAWINGS / TECHNICAL DATA TO SATISFY OWNERSHIP NEEDS FROM DESIGN ASSESSMENTS TO DEMILITARIZATION
 - ROYALTY FREE USE OF DRAWINGS / TECHNICAL DATA FOR ACQUISITION IN AN EMERGENCY OR IF CONTRACTOR IS INCAPABLE OF MEETING GOVERNMENT NEEDS
 - LIMIT LIFE OF CONTRACTOR PROPRIETARY RIGHTS - SAY FIVE YEARS OR CURRENT STATUTORY LIMIT FOR SPARE PARTS
 - OPTION TO BUY OR LICENSE DRAWINGS/TECHNICAL DATA FOR GENERAL NEEDS OF GOVERNMENT

Draft Performance Spec. Hardware Acceptance Provisions

- Available on the Internet

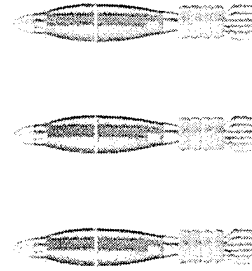
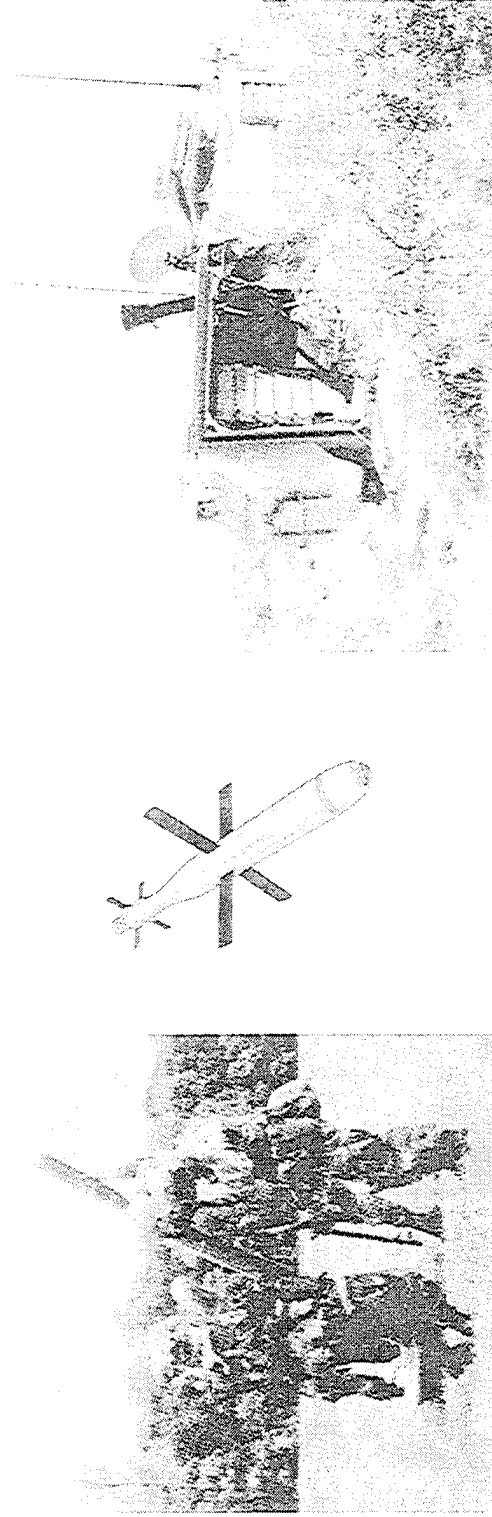
- ARDEC STANDARDIZATION BRANCH

- <http://www.pica.army.mil/orgs/edmd/eddd/sb/top.html>

- Draft Performance Spec. Quality Assurance Provisions

Advanced Planning for Industry

PM Mortars Overview

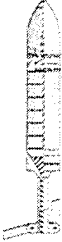
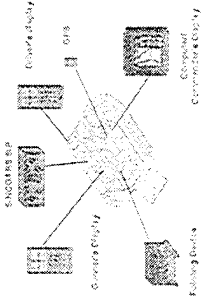
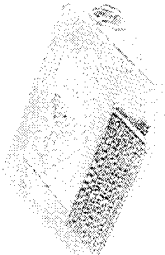
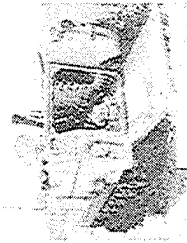


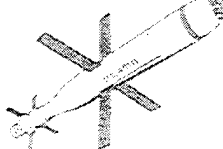













LTC Steve Davis
PM Mortars

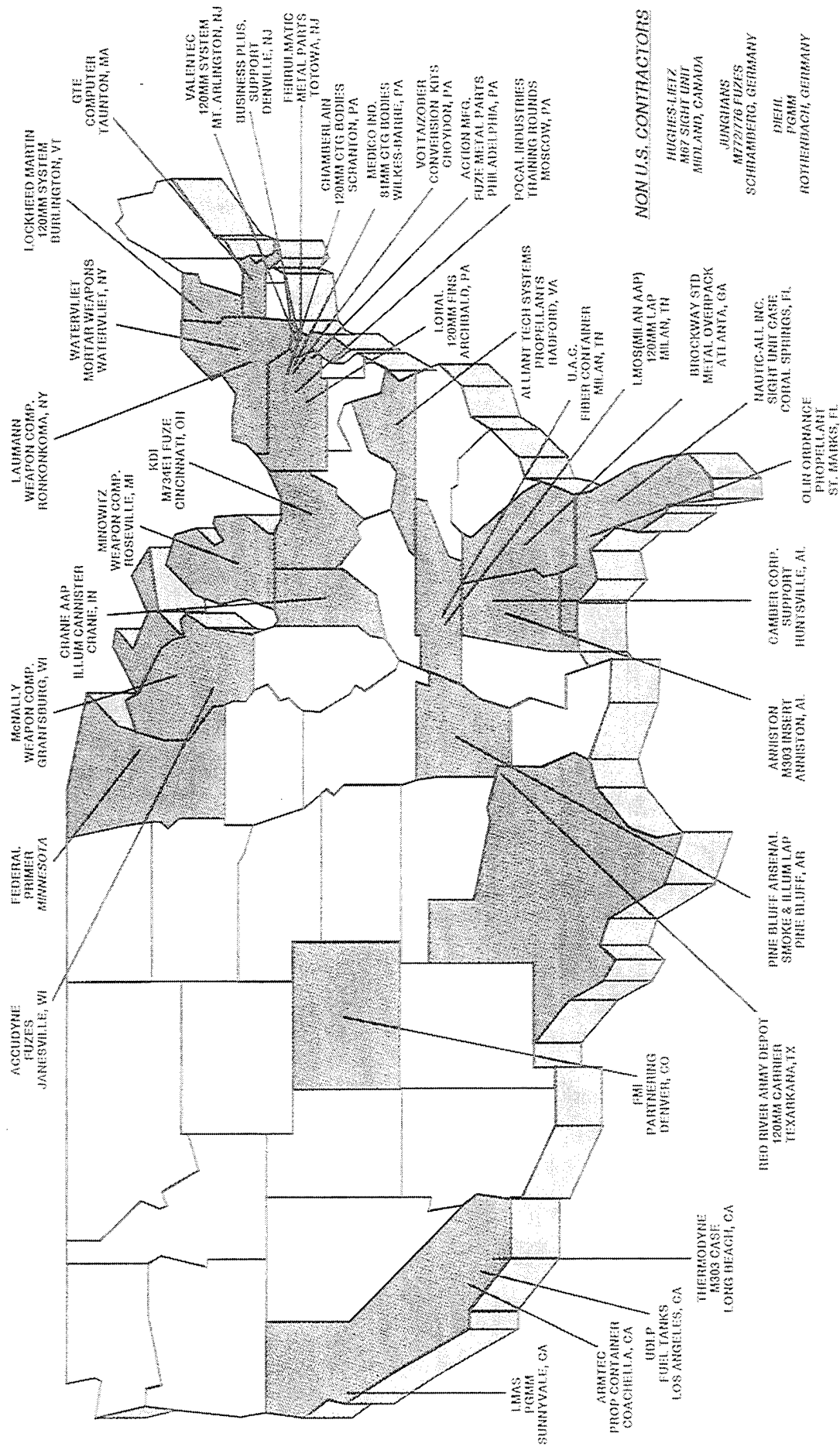
PM Mortars Charter

Manage development, test, qualification,
initial production and fielding of new mortar
weapon ammunition and fire control systems
for US DoD customers

MORTARS SPANS THE ACQUISITION SPECTRUM

| CONCEPT | DEMONSTRATION | DEVELOPMENT | PRODUCTION & FIELDING | MODS |
|---|---|---|--|--|
|  <p>Lightweight Composite 120mm DPICM Multi-Spectral Smoke Non-Lethal Warheads</p> |  <p>MORTAR FIRE CONTROL SYSTEM</p> |  <p>M30, IMBC</p> |  <p>M121</p> |  <p>81mm IR ILLUM</p> |
|  <p>TURRETED MORTAR SYSTEM (TMS)</p> |  <p>PRECISION GUIDED MORTAR MUNITION (PGMM)</p> |  <p>120mm ILLUM</p> |  <p>120mm HE/PD-MO</p>  <p>120mm SMOKE</p>  <p>81mm HE/PD-MO</p>  <p>60mm SHORT RANGE TRAINING ROUND</p> |  <p>60mm IR ILLUM</p>  <p>M734E1 MULTI-OPTION FUZE</p> |
| |  <p>UNIVERSAL FUZE FCT</p> |  <p>120mm FULL RANGE TRAINING CARTRIDGE</p> |  <p>M303 INSERT</p>  <p>M67 SIGHT UNIT</p> | |

PM Mortars Prime & Major Contractors



NON U.S. CONTRACTORS

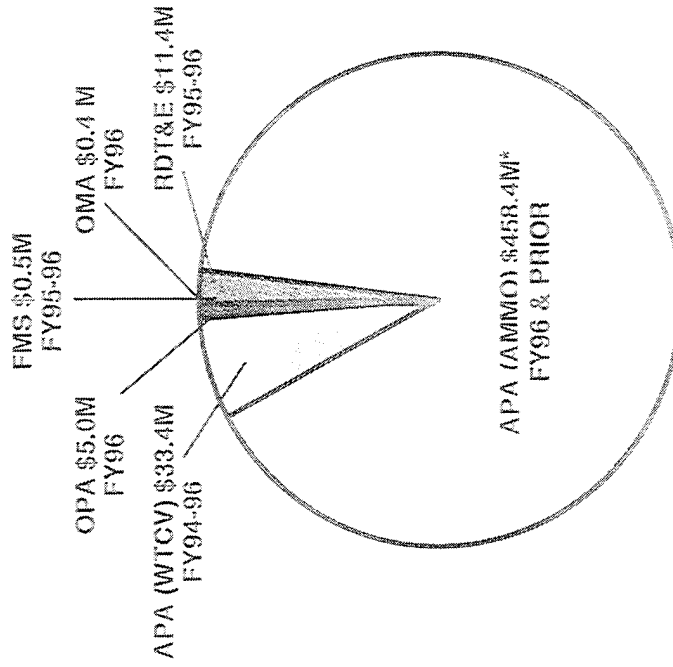
HUGHES-LEITZ
M67 SIGHT UNIT
MILANO, CANADA

JUNGHANS
M72/76 FUZES
SCHMIDBERG, GERMANY

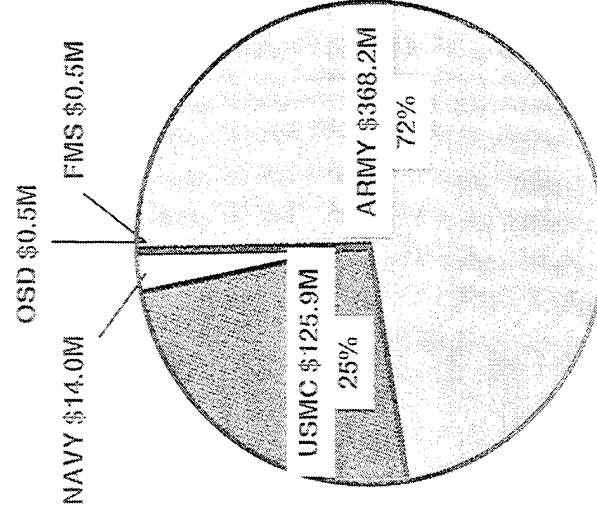
PIEHL
PGMM
ROTHENBACH, GERMANY

Total Program Funding Available

BY APPROPRIATION



BY CUSTOMER



TOTAL \$509.1M

\$219.7M Unexpired/Undelivered
Ammo Prior to FY94

AS OF 29 FEB-96

OPPORTUNITIES FOR INDUSTRY

120MM PRODUCTION

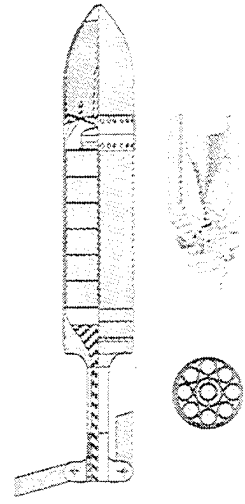
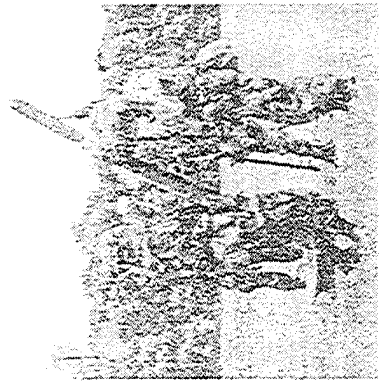
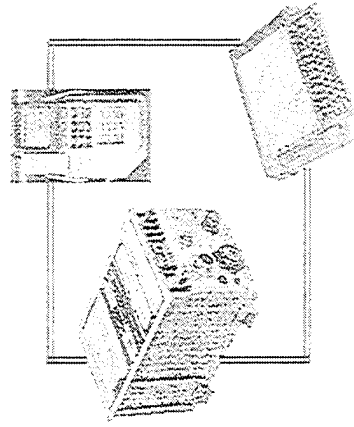
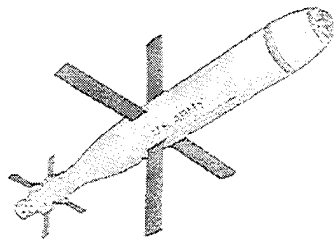
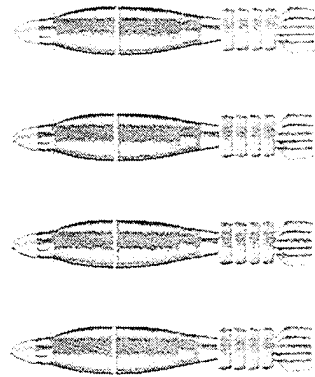
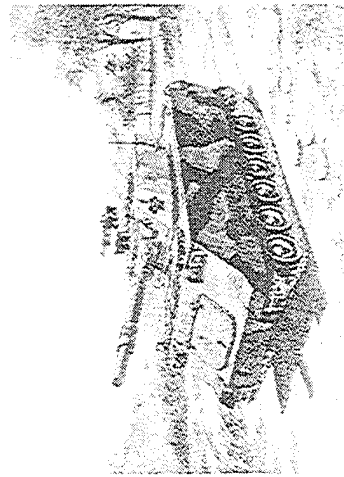
| <u>ITEM DESCRIPTION</u> | <u>APPROX \$M</u> | <u>COMP/NON-COMP</u> | <u>ISSUE</u> | <u>EST AWARD</u> |
|---|-------------------|----------------------|--------------|------------------|
| 120mm Cartridge Bodies (FY96-00) | \$ 11.3M (96) | NC - Chamberlain | 3QFY96 | 4QFY96 |
| 120mm Increment Containers (FY96-00) | \$ 1.6M (96) | NC - Armtec | 3QFY96 | 4QFY96 |
| 120mm Pin Assemblies (FY96-00) | \$ 3.1M (96) | Limited Comp.* | 3QFY96 | 4QFY96 |
| 120mm Ignition Cartridge/ Ignition Cartridge LAP (FY96-00) | \$ 1.2M (96) | Limited Comp.* | 3QFY96 | 4QFY96 |
| 120mm Propelling Charge (FY96-00) | \$.5M (96) | Limited Comp.* | 3QFY96 | 4QFY96 |
| PA153 Fiber Containers (FY96-98) | \$.7M (96) | Limited Comp.* | 3QFY96 | 4QFY96 |
| PA154 Fiber Containers (FY96-98) | \$ 1.2M (96) | Limited Comp.* | 3QFY96 | 4QFY96 |
| M734E1 Fuze (FY96-97) | \$ 13.0M (96) | NC-KDI | 3QFY96 | 4QFY96 |
| M931 Full Range Training Round (FY96) | \$ 13.0M (96) | NC-Pocal | 3QFY96 | 4QFY96 |

* Limited to U.S. manufacture per Public Law

POC: Ray Klapal/Rhonda Chuchwa (201) 724-4704.

| <u>ITEM DESCRIPTION</u> | <u>OTHER PROCUREMENT ACTIONS</u> | | | <u>EST AWARD</u> |
|--|----------------------------------|----------------------|--------------|------------------|
| | <u>APPROX \$M</u> | <u>COMP/NON-COMP</u> | <u>ISSUE</u> | |
| M766 Short Range Ctg (95-98) | \$ 1.2M (95) | Competitive | 04 Mar 96 | Aug 96 |
| Mortar Ballistic Computer | \$ 3.4M (96) | NC - Common Hardware | N/A | Apr 96 |
| Electronic Time Fuze (For FCT) (FY96) | \$ 1.0M (96-97) | Limited Competition | Apr 96 | Jun 96 |
| M722 Fuze (FY96) | \$ 3.9M (96) | NC - Jumphans | Apr 96 | Aug 96 |
| M776 Fuze (FY96) | \$ 9.1M (96) | NC - Jumphans | Apr 96 | Aug 96 |

USAIS Modernization Priorities



- Mortar Fire Control System
- Complete 120mm Family Of Ammunition
- Precision Guided Mortar Munition
- Composite Extended Range DPICM Ammunition
- Replace 81mm With Towed 120mm In Light Forces
- Turreted Mortar System

PM Mortars

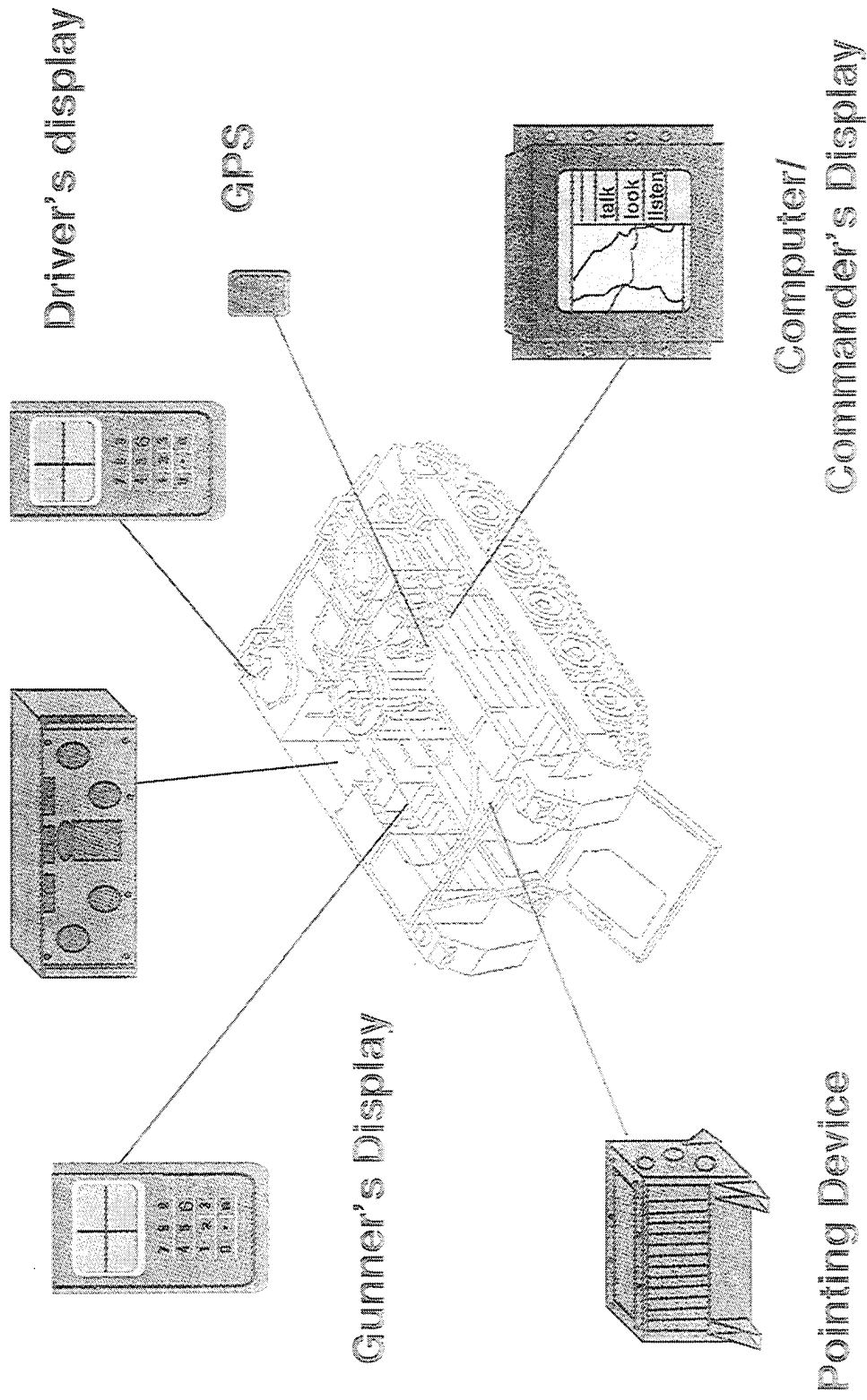
What is MFCS?

**The Mortar Fire Control System
will revolutionize the use of
mortars on today's battlefield**

- On-board Ballistics
- On-board POS/NAV
- Digital Communication

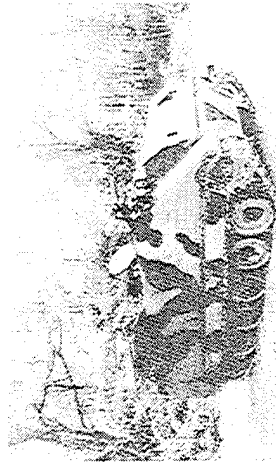
MFCs Components

SINGGARS SIP



Leverages Army's significant investment in 120mm mortar

MFCs Capability Growth



M1064
Demonstrator Vehicle

Focused Dispatch:

- DRU on Tube, Non Firing Only
- Ballistics at Gun
- Second Computer for Situational Awareness
- Digital Commo
- External GPS
- More Integrated Ops
- 120mm System

Objective System:

- Reference Unit on Gun-Shock Resistant
- One Computer w/FC, Sit Aware, GPS
- 188-220(a)/AFATDS compatible
- Fully Integrated System

Key Technologies

- Weapon pointing -
- RLG/FOG
- GPS-I
- Digital Commo -
- SINGARS
- EPLRS
- Digital Fire Control Computer

NTC 94-07:

- Optical link to DRU
- No Ballistics at Gun
- External GPS
- Voice Only Radio
- Swivel Chair Ops
- 4.2 In System

Technical Challenges

- Affordable/high accuracy pointing system (1-3 mil pointing accuracy)
- Shock mounting
- Reduce size/weight
- Limit cables/power required

Program Goals

- **Reduced procurement time**
 - Competitive Best Value
 - Electronic RFD/Bulletin Board
 - Industry Input
 - Teamwork
- **Reduced development time**
 - Performance Based Specification
 - Teaming with Government/Contractor
 - Software Re-use

The MFCS program is Steamlined

Mortar Fire Control System

Program Funding

RDTE

| | <u>96</u> | <u>97</u> | <u>98</u> | <u>99</u> | <u>00</u> | <u>01</u> | <u>02</u> | <u>03</u> | <u>04</u> | <u>05</u> | <u>Total</u> |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------|
| Requirement | 2.1 | 3.8 | 11.1 | 9.3 | | | | | | | 26.3 |

PROCUREMENT

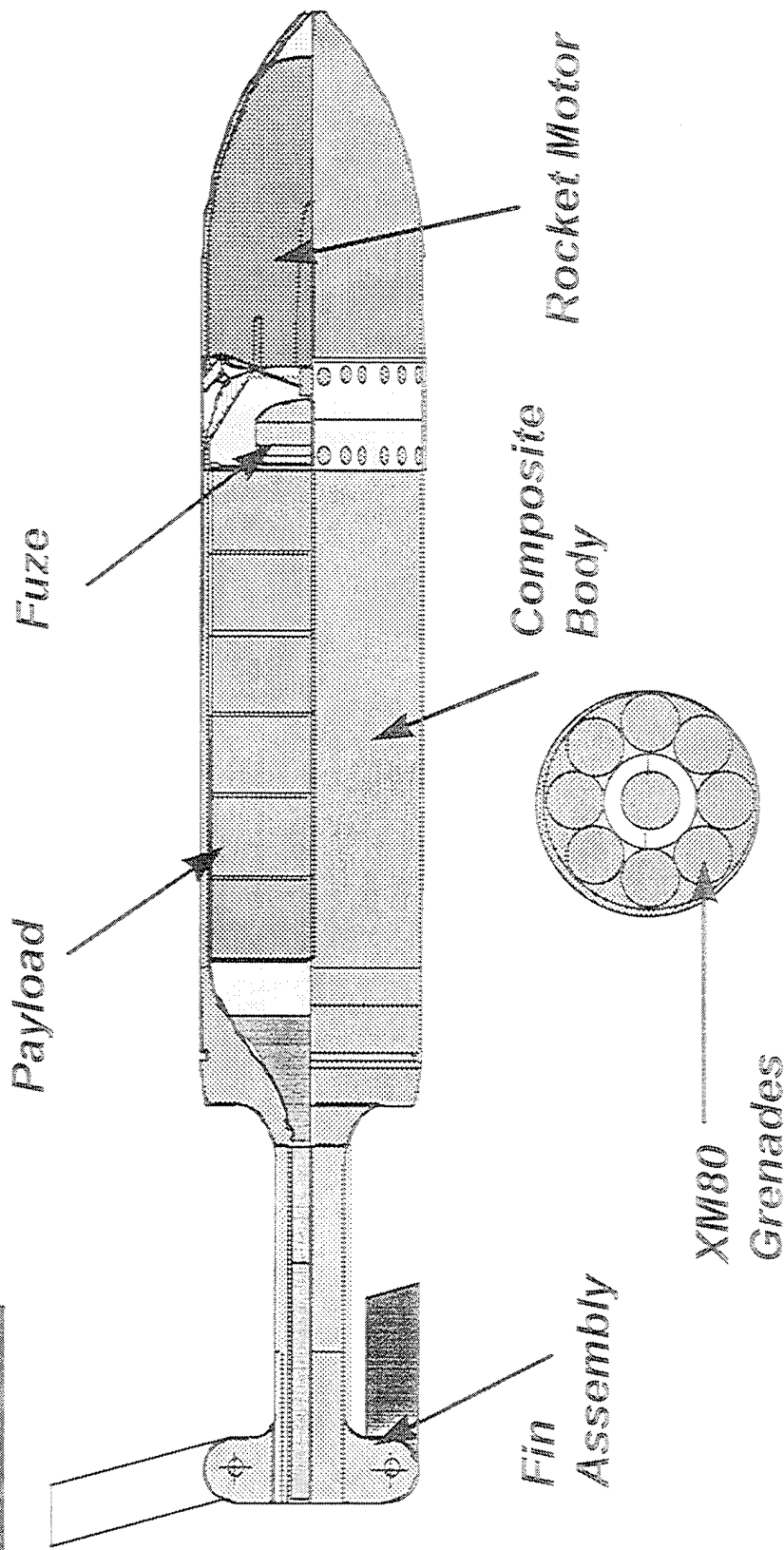
| | <u>00</u> | <u>01</u> | <u>02</u> | <u>03</u> | <u>04</u> | <u>05</u> | <u>06</u> | <u>Total</u> |
|----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------|
| Requirement | 5.0 | 19.0 | 32.5 | 29.7 | 28.1 | 25.0 | 10.0 | 153.9 |
| Qty Gun Tracks | 23 | 83 | 113 | 109 | 108 | 116 | 48 | 600 |
| Qty FDC | 4 | 15 | 18 | 16 | 16 | 16 | 7 | 92 |

NOTES: Includes force package 1 and 2.

UNIT COST: Constant FY95 \$ Gun Track - 210,236; FDC \$146,170

120 mm Long Range DPICM Mortar Cartridge

Description



Maximum Range 11 km
Payload 54 XM80
Lethality 1.8 x M934

Multifunctional Electronic Fuzing
Lightweight Materials
Payload Flexibility

SCHEDULE/COST

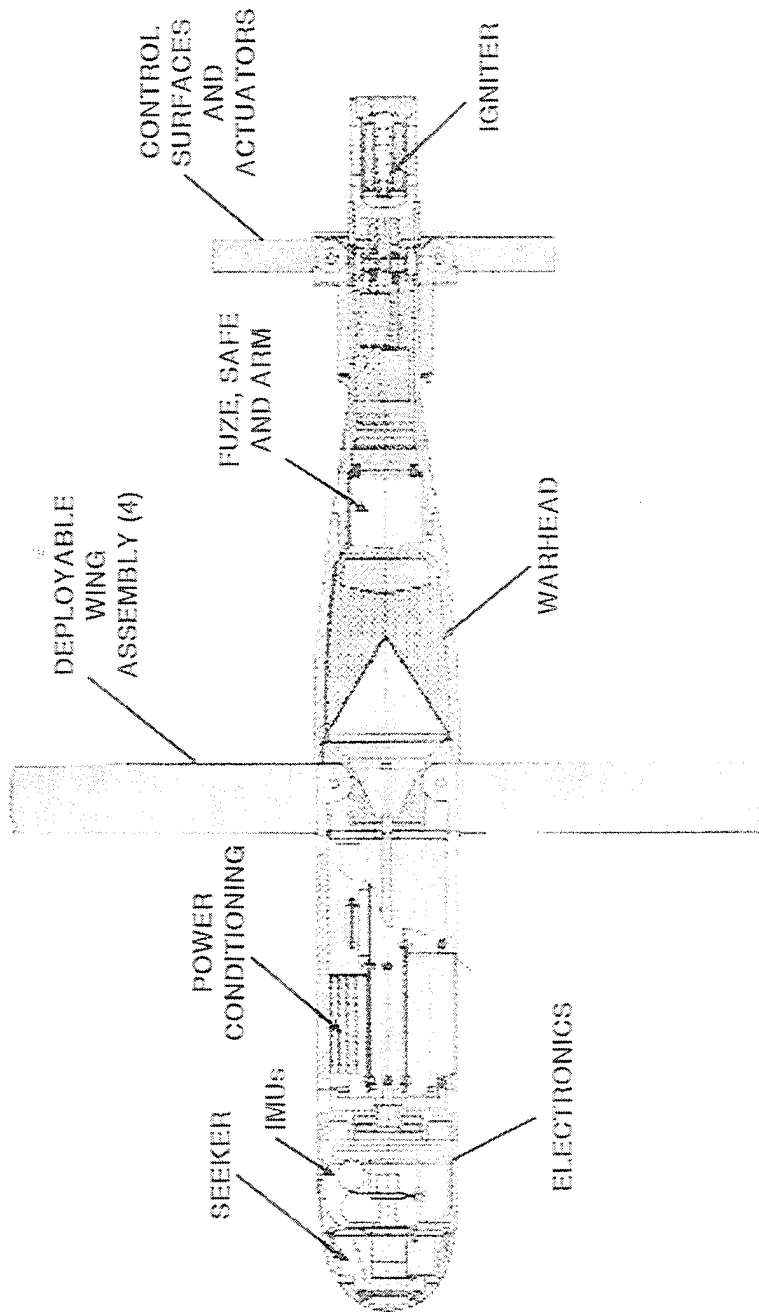
| XM984 | FY 1996 | FY 1997 | FY 1998 | FY 1999 | FY 2000 | FY 2001 | FY 2002 | FY 2003 |
|--------------------------|--------------|--------------------------|------------------|------------------|-------------------|-----------------------------|---------|---------|
| CONCEPT DEMO/VALIDATION | | | | | | | | |
| Projectile Design & Sim | | | | | | | | |
| Fuze Concept Study | | | | | | | | |
| PROOF OF PRINCIPLE | | | | | | | | |
| Propulsion Update | | | | | | | | |
| Design Fab Test | | | | | | | | |
| Integrated Round Testing | | | | | | | | |
| EMD | | | | | | | | |
| Tech Test | | | | | | | | |
| User Test | | | | | | | | |
| TYPE CLASSIFY | | | | | | | | |
| PRODUCTION/FUE | | | | | | | | |
| 6.2 | 250 (800) | | | | | | | |
| 6.3 | | (500) (2600) (400) | (4500) (1600) | (9000) (4000) | (10000) (3000) | (6500) (2000) (20000) | (40000) | (60000) |
| RDT&E | | | | | | | | |
| PAA | | | | | | | | |

NOTE: () denotes unfunded projectile costs
 () denotes unfunded fuze costs
 * UPC \$1200 for 100,000 rounds

PM Mortars

PRECISION GUIDED MORTAR MUNITION

| SEEKER SECTION | MIDBODY SECTION | WARHEAD SECTION | TAIL SECTION | PROPULSION SYSTEM |
|----------------|-----------------|-----------------|--------------|-------------------|
|----------------|-----------------|-----------------|--------------|-------------------|



Capable of engaging high value point targets with semi-active laser mode
 Capable of engaging armor with autonomous infrared seeker
 Tandem warhead has demonstrated destruction of bunker and armor targets

PGMM PROGRAM PLAN

| FY | 95 | 96 | 97 | 98 | 99 | 00 | 01 | 02 | 03 | 04 | 05 |
|----|----|----|----|----|----|----|----|----|----|----|----|
|----|----|----|----|----|----|----|----|----|----|----|----|

| |
|---------------|
| Adv Tech Demo |
|---------------|

| |
|-----|
| EMD |
|-----|

| |
|------------|
| Production |
|------------|

| | | | | | | | | | | | |
|--------|-----|------|-----|-----|-----|--|--|--|--|--|--|
| F(\$M) | 5.6 | 10.2 | 7.0 | 4.2 | 4.0 | | | | | | |
|--------|-----|------|-----|-----|-----|--|--|--|--|--|--|

| | | | | | | | | | | | |
|--------|--|--|--|--|--|----|----|----|----|-----|-----|
| U(\$M) | | | | | | 29 | 38 | 30 | 79 | 132 | 102 |
|--------|--|--|--|--|--|----|----|----|----|-----|-----|

| | | | | | | | | | | | |
|--------|--|--|--|--|--|--|--|--|-----|---|---|
| QTY(k) | | | | | | | | | 2.5 | 7 | 7 |
|--------|--|--|--|--|--|--|--|--|-----|---|---|

- Includes \$6M Congressional Plus-Up In FY96

Point of Contact

Andrew J. Wood
APM, Advanced Programs/International Programs
Product Manager, Mortar Systems
Picatinny Arsenal, NJ 07806-5000

Phone (201) 724-5805

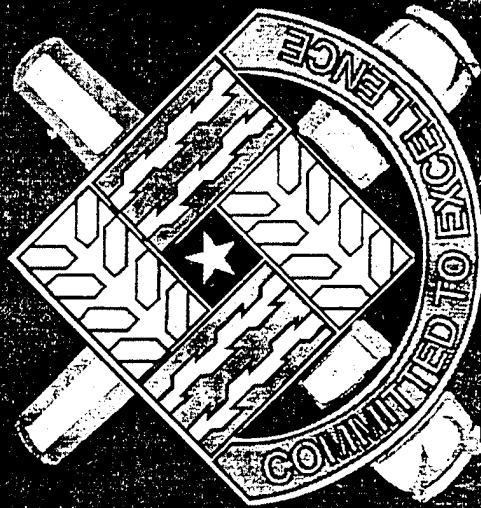
Fax -3909

**No country, its military critics
invariably discover afterward, is
ever adequately prepared in
munitions**

The Guns of August

INDUSTRIAL ECOLOGY CENTER

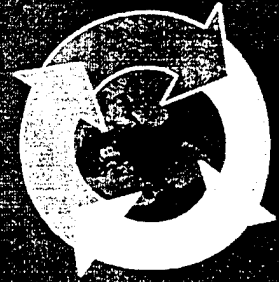
3 APR 96



J.M. Argento, PhD
(201) 724-2428

OUTLINE

- Introduction to ARDEC's Industrial Ecology Center
- Success Stories
- Summary



INDUSTRIAL ECOLOGY CENTER

Industrial Ecology Center

A flexible, responsive and skilled team of individuals that are a key resource for environmental technology and management practices in the Army, DOD and Industry

Located at the ARDEC, Picatinny Arsenal, NJ



INDUSTRIAL ECOLOGY CENTER

What is Industrial Ecology?

"Industrial Ecology" emphasizes the need to understanding the flow of materials and energy through industrial systems, the effects of these flows on the environment, and the influences of technology, regulations and operational practices on the flows. Industrial ecology incorporates such approaches as analyzing process flows, recycling wastes into inputs, examining the entire life cycle of products and designing products from the beginning with the environment in mind.

National Environmental Technology Strategy, April 1995



INDUSTRIAL ECOLOGY CENTER

Why Industrial Ecology?

Looks at total cost, addresses before-the-fact (R&D of product, materials and processes) rather than after-the-fact costs of violations, clean-up and remediation



INDUSTRIAL ECOLOGY CENTER

ORGANIZATIONAL STRUCTURE

MATRIX SUPPORT

ACQUISITION CENTER

M. O'CONNELL x6630
M. MORIAU x2016
L. FRANZ x4894

LEGAL OFFICE

R. HENNESSY (ENV/LAW) x6584
M. KANE (NDGEE) x5502
F. GOLDBERG (PATENT) x6590
D. SCOTT (GRDAS) x6585

TECHNICAL SUPPORT

R. BLAJDA, P.E. x5913

QUALITY ASSURANCE

H. VAN DYKE x4071

LEGEND

COMMERCIAL (201)724-XXXX

DSN 880-XXXX

FAX 201-724-8759/2314

EMAIL: elo@pica.army.mil

WEB SITE: <http://www.pica.army.mil/orgs/elo/rop.html>

INDUSTRIAL ECOLOGY CENTER

| | | |
|-------------------|----------------|-------|
| DIRECTOR | R. SCOLA, P.E. | x2044 |
| ADM ASSISTANT | D. GOROG | x3279 |
| SECRETARY | D. WARNER | x3279 |
| COMPUTER ASST. | V. GRECO | x7524 |
| FINANCIAL ANALYST | A. GROUNDARD | x2299 |
| BUDGET ANALYST | D. GOBLE | x4007 |
| ADM OFFICER | D. GOROG | x3279 |

ENVIRONMENTAL ANALYSIS

R. MOREIRA x2617
L. PASTERICK x7540
A. SCHWIER x4093
J. SHUM x4071

ENVIRONMENTAL TECHNOLOGY

T. SACHAR x2364
J. FRANKOVIC x5650
J. BORRI, P.E. x5744

ADMIN SUPPORT

E. TOROLA x6336

THRUST MANAGERS

R. KATZ x6518
R. GOLDBERG x4078
D. YEE x6286
M. NAPOLITANO x3615
DR. J. DEFRANK 410-671-3972
B. DONAHUE 217-373-3480
R. BENJAMIN x2657

TECHNOLOGY DEMONSTRATIONS

NATIONAL DEFENSE CENTER FOR ENVIRONMENTAL EXCELLENCE

M. WRAZEN, (COR) x3730
N. COLON x2482
A. GOETZ, P.E. x6324
D. DEMONE x6773

PROGRAM MANAGEMENT

G. KOSTECK, P.E., D.E.E. x6755
D. TOLLIVER x4084

ADMIN SUPPORT

L. DEMARCO x4666

TECHNOLOGY DEVELOPMENT & TRANSITION

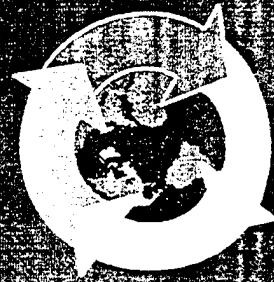
DR. ARGENTO x2428
R. ZANOWICZ x5744
J. THEIS x5795



Dept. of the Army
Armament Research, Development and Engineering Center
Industrial Ecology Center
Building 172
Picatinny Arsenal, NJ 07808-5000

WHAT "R" WE DOING?

- Readiness
 - Manufacture
 - Maintenance
 - Training and Testing
- Reduction
 - Recycle, Recover, Reuse
 - Hazardous and Solid Waste
- Return on Investment
 - Tools
 - Methodology



INDUSTRIAL ECOLOGY CENTER

FUNDING PROFILE

TOTAL BUDGET

| <u>FY94</u> | <u>FY95</u> | <u>FY96**</u> |
|-------------|-------------|---------------|
| \$46M | \$36.9M | \$18.9M |

** As of 21 FEB 96



INDUSTRIAL ECOLOGY CENTER

Our customer base is increasing.

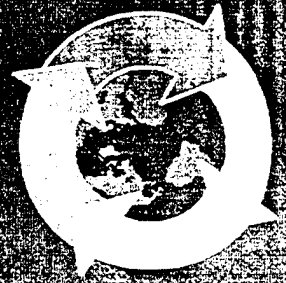
Customers

- DOD/DA
- PEO/PM
- OTHER SERVICES
- FEDERAL & STATE
EPA
- FOREIGN
GOVERNMENTS
- INDUSTRIAL BASE
- MANUFACTURING
AND ENGINEERING
CENTERS
- ACADEMIA

Potential

Customers

- DEPARTMENT OF
AGRICULTURE
- DEPARTMENT OF
TRANSPORTATION
- DEPARTMENT OF
ENERGY
- DEPARTMENT OF
COMMERCE



INDUSTRIAL ECOLOGY CENTER

CUSTOMERS' BENEFITS

- Availability of expertise
- Access to Government & NDCEE facilities
- Manage the entire program

"One Stop Life Cycle Organization"

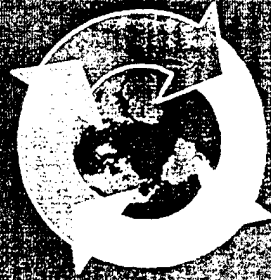
- Leverage of R&D dollars and resources through team efforts
- Increased awareness of environmentally sound solutions
- Closer relationship with Government and Industry via CRDAs & Partnership



INDUSTRIAL ECOLOGY CENTER

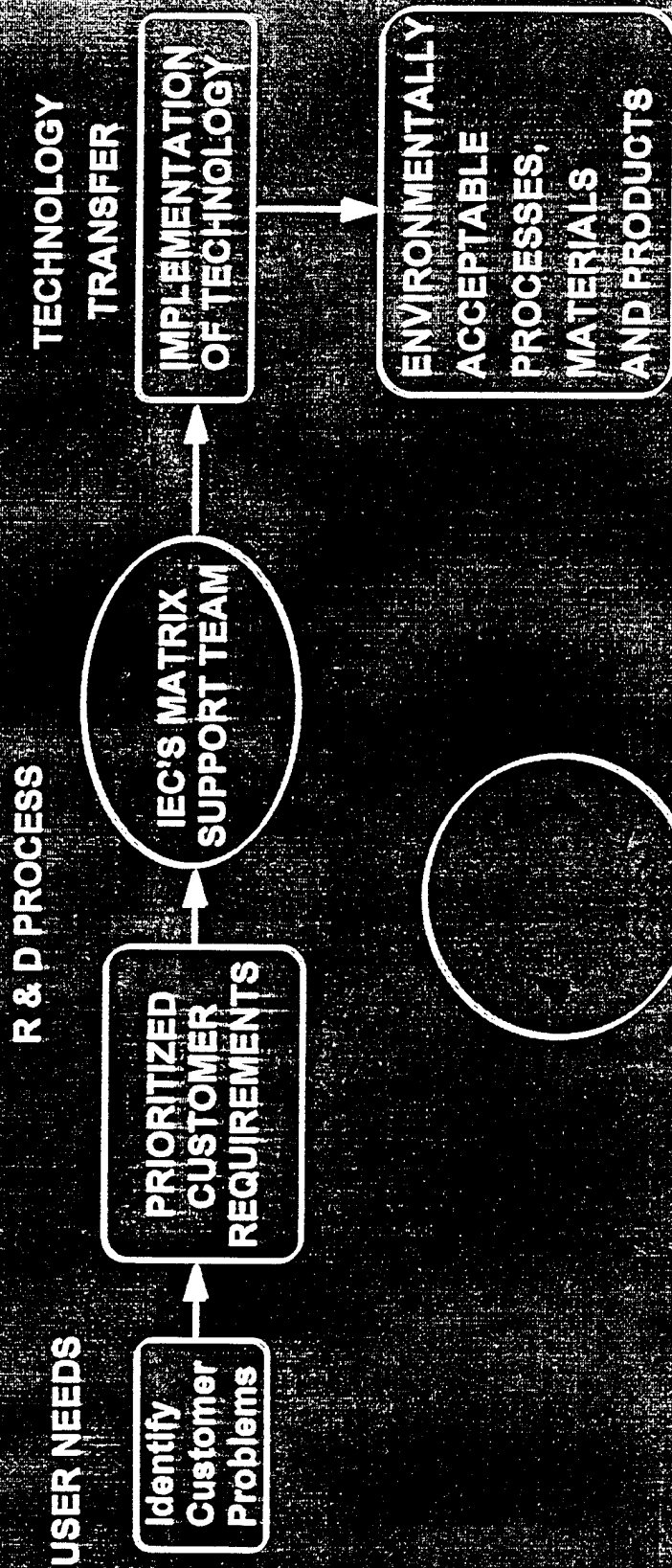
“NO JOB TOO LARGE OR SMALL”

- **U.S. Army Pollution Prevention Environmental Quality Program**
- **DOD National Defense Center for Environmental Excellence (NDCEE)**
 - **Environmental Information Analysis System**
 - **Demonstration Factory**
 - **Contractor/Government Staff**
- **Environmental R&D Programs**
- **Demonstration Validation Program**



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HOW DOES IEC SUPPORT THE CUSTOMERS' NEEDS?



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Opportunities for Industry

- Small Business Innovation Research
- Working with the National Defense Center for Environmental Excellence
- Cooperative Agreements
- Cooperative Research and Development Agreements
- Strategic Environmental Research and Development Program
- Environmental Security Technology Certification Program



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IEO is involved all phases of complete product Life Cycle

Basic Research & Development

Demonstration/Validation

Engineering/Manufacturing Development

Operational System Development

Demilitarization



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SUCCESS STORIES

Green Bullet

INTEGRATED PRODUCT TEAM

- **Objective**

- Hazardous material identification and replacement for the Green Bullet (5.56mm & 7.62mm)

- **Progress**

- Hazardous material are being identified via spec/std review, TDP review and process audit
- Analysis of toxic reduction inventory data and cost data at Lake City AAP scheduled

- **Benefits**

- Eliminates Lead/Antimony in Projectile Core (1.9 million lbs/yr) and Primer (25 K Lbs/yr). Avoids Expensive Ventilation at Indoor Ranges (\$150 K/Range). In 1988, 600 Ranges Found Inadequate, Avoids Expensive Cleanup of Outdoor Ranges. Eliminates MEK, Toluene, and Xylene in Sealants and Lacquers.

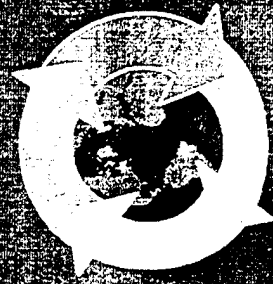


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SUCCESS STORIES (Cont'd)

WASTE ACID DETOXIFICATION AND RECLAMATION SYSTEM @ WATERVLIET ARSENAL (P2 PROJECT, ESTCP)

- **Objective**
 - To use the latest technologies to recover the waste acid, separate it into its various components, and reuse the materials
- **Progress**
 - Would be installed and operated at Watervliet Arsenal for several months to study how well the system works
- **Benefits**
 - Up to \$120,000 a year could be saved in waste and, possibly, an additional \$28,000 in materials, disposable waste reduced by 70 tons, \$10M a year saving from using this technology, and DOD could more easily comply with new HazMat and pollution prevention standards.

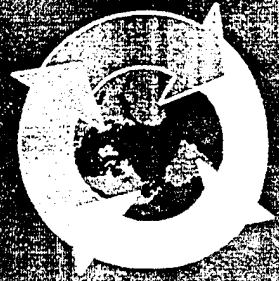


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SUCCESS STORIES (Cont'd)

Combustion Laser Detector (SERDP)

- **Objective**
 - To detect 12 Combustion Species by using Tunable Diode Laser Technology (ARL is working with Laser Photoacoustic Inc and Southwest Scientist Corp.)
- **Progress**
 - Demonstrated capability of Combustion Tunable Diode Laser Detector
- **Benefits**
 - Improve safety of crews by establishing levels of exposure to toxic gases as well as depletion of breathable air, comply with E.O. 12856 and improve military readiness.



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SUCCESS STORIES (Cont'd)

Environmental Cost Analysis

- **Objective**

- Develop Pilot Projects to Demonstrate the Use of Environmental Cost Accounting by the Federal Government and Coopers & Lybrand
- Report on the Demonstration Projects and Make Recommendations on the Use of Environmental Cost Accounting in the Federal Government
- Issue a Directive to Implement Environmental Cost Accounting in the Federal Government

- **Progress**

- Documenting the nominated pilot projects for incorporation into a report on environmental cost guidelines

- **Benefits**

- Provide federal decision makers with additional environmental cost information into existing cost accounting procedures and/or recognizing embedded environmental costs (training, pollution control, remediation costs, penalties, fines, and others) and allocating them to appropriate products of processes.



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SUCCESS STORIES (Cont'd)

New Jersey Institute of Technology & ARDEC
Solvent Reduction Project

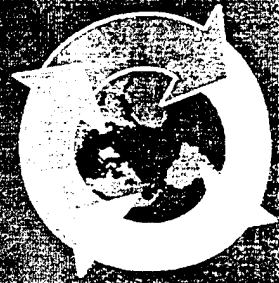
- **Objective** (solvent substitutes for ammunition manufacturer)
 - Identify Solvent use in Military Specifications
 - Identify Specific Applications for Intensive Study
 - Identify Non-Solvent or Less Hazardous Solvent Opportunities
 - Determine Steps Necessary to Modify Specification and Technical Data Packages
- **Progress**
 - Reviewed Placatinny Specifications for Hazardous Materials: Ether Chosen
 - Determined Uses of Ether
 - Researching Possible Ether Alternatives
 - Reviewed Lake City AAP Manufacturing Process for Use: Solvent to be Determined
- **Benefits**
 - Cost savings, increased readiness, and comply with E.O. 12856



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SUMMARY

- One Stop Life Cycle Environmental Center
- Unique perspective of installation, DA, DOD and other federal programs
- Flexible, responsive, skilled team with leveraged resources in government, industry and academia
- Good track record for implementation of technology
- Through NDCEE successful information clearinghouse for both the government and industry
- Valuable resources to DOD and industry
- Successful cooperative partnership and share quality objectives with our teams & partners
- Brokers for tomorrow's environmental technologies



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NDCEE SUCCESS STORIES

- **Corpus Christi Army Depot (CCAD) Powertrain Cleaning** used for cleaning engine, transmission, and powertrain components
 - **Benefits:** Cost reductions thru reduced health liability and enhanced readiness by increased productivity (25%) which will improve peak production in wartime scenarios and eliminate dependence on ODCs.
- **Automated Ultrahigh-Pressure Waterjet Coatings Removal** utilized to remove coating from jet engine seals (at CCAD)
 - **Benefits:** 1 to 1.5 year payback period based upon a \$1M initial capital outlay, reduced coating removal time from 12 hrs to 20 mins with no substrate damage, eliminate hazardous processes and air emissions.
- **Plasma Arc Technology** will be used to deal with Army's disposal of hazardous waste, toxic, carcinogenic, including organic, inorganic, heavy metals, and asbestos
 - **Benefits:** Minimal waste pretreatment, easily scrubbed gaseous products, toxic waste stabilization in a leach-resistant and vitrified slag, process waste products, decreased air pollution control equipment costs thru low, off-gas volume, estimated \$100-\$2,000/ton and is highly dependent on the waste stream to be treated.



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NDOT SUCCESS STORIES

(continued)

- Naval Aviation Depot- Jacksonville (NADEP- JAX) Powder Coating technology demonstrations with Navy aircraft components were successfully conducted and currently being implemented at Depot
 - Benefits: Elimination of 6,700 lbs of VOC emissions and 28,000 lbs of hazardous waste discharges, reduce coating procurement cost by \$40,000 and realized an estimated 1.5 yr pay back, \$840,000 life-cycle savings.
- Texas Instruments (TI) Powder Coating technology demonstrations with missile composite components are being performed and initially verified via tests the feasibility of powder coated composite radomes
 - Benefits: Reduced VOC emissions and production cost, and use of excess capacity in the existing powder coating facility.
- Englo Products Powder Coating technology demonstration was successfully performed for their products and has procured a powder coating system
 - Benefits: Eliminated 27,000 lbs of VOCs/yr, improved product quality and productivity.



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